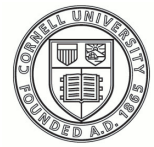

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A (Less Than) Zero Sum Game? State Funding for Public Education: How Public Higher Education Institutions Have Lost

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Abstract

It is well known that public higher education funding fluctuates dramatically with the business cycle – bearing the brunt of the legislative axe during tight budget periods with the expectation that it will be generously increased when flush times return. What is not well known is that public higher education budgets have suffered a steady erosion in funding priority for over 25 years – including during the bull-market of the 1990s. In particular, between 1977 and 2001, in all fifty states, three budget share measures have suffered substantial declines. First, the average share of state general fund budgets allocated to public education has fallen by four percentage points. Second, the average share of public education budgets allocated to public higher education has fallen by six percentage points. Third, the average share of public higher education budgets allocated to institutions (as opposed to direct student aid) has fallen by four percentage points. Together the declines have translated into real institutional appropriation losses of $2,800 per student in an "average" state –significantly more than the approximately $1,700 increase in real average public four-year instate tuition rates over this same period.

Using a rich panel data set spanning 26 years that was assembled from a variety of sources, I estimate a variety of specifications to investigate the causes of the declines in these three budget share measures. Among the main findings are that competing budget items do not appear to "crowd out" education's budget share, rather its fall is caused primarily by changes in the income distribution within states. Court mandated K12 funding equalization has resulted in substantial increases in education spending within states, however, over a third of this increase has come at the expense of public higher education.

Attempts by public institutions to respond to lagging state appropriations by increasing tuition or private fundraising efforts are seen to trigger a cycle of future higher education budget share cuts, which calls into question what politicians expect institutions to do in the face of budget difficulties, as the institutions rapidly spiral toward a private "high tuition" equilibrium. The sensitivity of higher education budget shares to observable state factors has increased over time and dynamic panel estimates indicate that states exercise more discretion over the determination of the higher education – K12 split than they do over other budget decisions.

Three additional findings indicate that states have taken advantage of the higher education finance system to achieve other goals. First, the increasing ethnic heterogeneity across the noncollege and college aged cohorts has led to a shift of funding away from higher education. Second, the surge in popularity of targeted, non-means tested student aid programs appears to have been in an effort to redistribute income to economically well-off families. Finally, states appear to have "gamed" the higher education finance system to take advantage of perverse incentives created by federal student aid programs. Specifically, as more households in a state become eligible to receive federal Pell grants, states respond by moving aid away from institutions and toward students – allowing tuition to rise and to capture increased eligibility for federal grant aid.

Keywords

higher education, public education, state funding

Comments

A (Less Than) Zero Sum Game?
State Funding for Public Education: How Public Higher Education Institutions Have Lost

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It is well known that public higher education funding fluctuates dramatically with the business cycle – bearing the brunt of the legislative axe during tight budget periods with the expectation that it will be generously increased when flush times return. What is not well known is that public higher education budgets have suffered a steady erosion in funding priority for over 25 years – including during the bull-market of the 1990s. In particular, between 1977 and 2001, in all fifty states, three budget share measures have suffered substantial declines. First, the average share of state general fund budgets allocated to public education has fallen by four percentage points. Second, the average share of public education budgets allocated to public higher education has fallen by six percentage points. Third, the average share of public higher education budgets allocated to institutions (as opposed to direct student aid) has fallen by four percentage points. Together the declines have translated into real institutional appropriation losses of $2,800 per student in an "average" state –significantly more than the approximately $1,700 increase in real average public four-year instate tuition rates over this same period.

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I. Introduction

> *"In general, however, my impression is that the great danger is not so much institutional extinction, or even that there will be a sudden, dramatic downward shift from one level of quality to another. The greater danger, I believe, is that there will be a slow, unspectacular, but cumulative decline in what it is possible to achieve – and then, as a next step in the process, in what one tries to achieve. Gradual changes of this sort are, in their nature, impossible to measure with any precision, and they may not even be noticeable to quite experienced observers until some considerable time after they have occurred."*
>
> *-- William Bowen, President of Princeton University (1977)*

Considerable time has passed since Bowen made these ominous comments to the AEA. While there is nothing unusual about university administrators crying out for more funds, a dramatic decline in support for public higher education in the intervening time period suggests that Chicken Little can no longer be ignored.

Few observers would disagree that America's stellar economic, scientific, political and cultural standing is largely a result of the proliferation of its system of education throughout the states since the nation's founding. Further, it is not a coincidence that America's permanent place among the global powers occurred only after public monies from our various legislative entities began spilling into a growing higher education system, changing it from largely a private domain of the elite aristocracy, to a tool for the lower and middle class public to achieve the "American Dream" as well.[2] Despite this and despite the large literature espousing the many benefits of investing in education, public higher education seems to be increasingly falling out of favor with both voters and governments alike.

The goal of this paper is to explain why public higher education *institutions* find themselves in the precarious budget situations they are in today. Among my findings are that changes in observable state characteristics can explain little of the observed fall in higher education budget shares. Generally speaking, public higher education spending has been crowded out by increasing demands for state support of K12 education as a result of court mandated equalization programs, but more importantly because of the great deal of discretion legislatures have over higher education spending. That institutional efforts to

[2] Goldin and Katz present an excellent analysis of the shaping of American public higher education during the time that it is commonly believed that America took its place on the world stage, 1890-1940.

raise private money and to increase tuition rates have been met with sharp cuts in budget shares, coupled with projected future enrollment pressures and the political popularity of non-need based aid program expansion, casts a pall on the ability of our public institutions to maintain accessibility and quality much longer into the future.

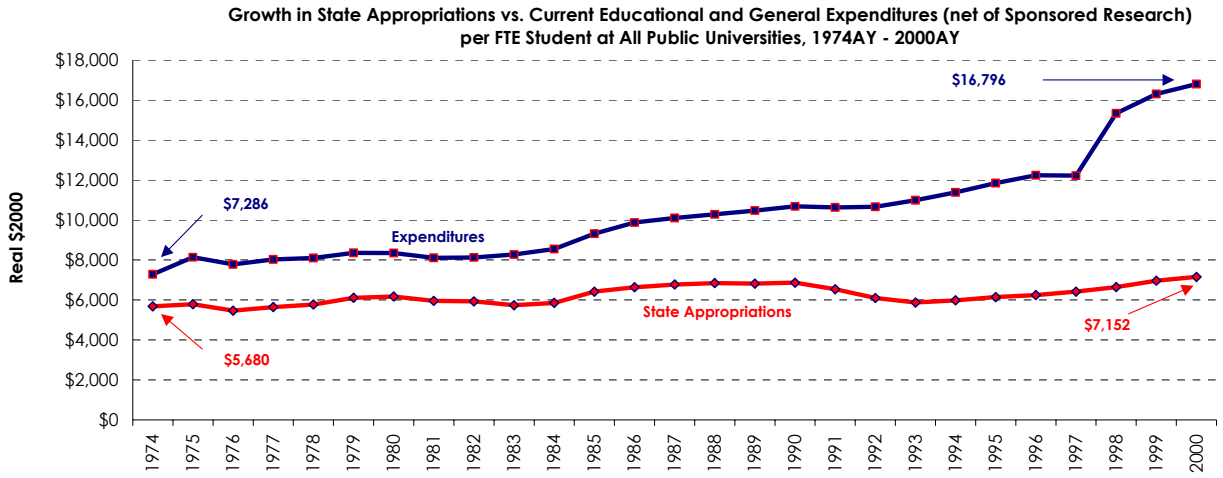
It should be emphasized that public universities are accustomed to their state funding being at the mercy of economic cycles. In bad budget times, higher education typically bears a disproportionate burden of state funding cuts, with the full expectation that it will be compensated during a recovery. This is not surprising given that higher education is the single largest discretionary budget item in state budgets. Higher education is also an attractive target for the legislative axe due to its ability to draw revenues from a variety of sources, most prominently tuition – a feature unique to this state budget item. That higher education funding *levels* fluctuate so much is well known and is not the focus of this paper. Rather I emphasize that, in *relative* terms, higher education funding has not fluctuated with the business cycle. Public higher education has faced a continuous precipitous drop in state governmental priority for nearly three decades.

In real terms, the level of state funding for public higher education doubled from $30 billion in 1974 to nearly $60 billion in 2000. However, due to the growth in public enrollments, the bottom line in figure 1 shows that per student funding increased in real terms by less than 1% per year (25.9% overall). Real current educational and general expenditures per student (less dollars spent on sponsored research) in public higher education, shown in the top line of figure 1, grew by over 3% per year (130% overall).[3] As a result, while state appropriations in 1974 were generous enough to cover 78% of the cost of schooling, in 2000 this support has fallen to just 43%.[4] That public universities and colleges are turning to tuition to more than make up for lost state appropriations has raised the ire of taxpayers and politicians alike.

[3] The sharp increase in reported expenditures may be due to differences in accounting and institutional reporting beginning with the 1997 academic year. Data prior to this year are reported in a different source than later data. However, even if in the unlikely event that actual expenditure levels were flat since 1997, overall growth for the period would have been approximately 70%.

[4] A large body of literature has been devoted to this phenomenon. I will not examine the reasons for expenditure growth in any detail in this paper. While this growth may be a reflection of improvements in quality, it is also likely

Figure 1



Sources: US Department of Education's IPEDS & Illinois State's GRAPEVINE System

What is less well known is that public education has undergone a sea-change in public priorities during this time period. While most laypeople, administrators and even statehouse representatives focus on the dollar values of the state appropriations, very little attention is paid to how higher education fares in relation to other budget items within each state. It is to this *relative* funding that I now turn.

As figure 2 indicates, between the fiscal year ending (FY) 1972 to FY2001, the average (across states) share of total state general fund expenditures on education fell from a high of 39.9% in 1972 to a low of 35.0% in 1993, with a slight recovery to 36.1% over the remainder of the decade.[5] While the decrease has not been monotonic, there is a clear downward trend and the cyclical behavior appears to revolve around this trend. The average general fund budget size (in 1998 dollars) in FY2001 was $19.7 billion. Had education been able to maintain its budget share at 1972 levels, the "average" state would have spent a whopping $750 million more for education in 2001. Given that there are on average one

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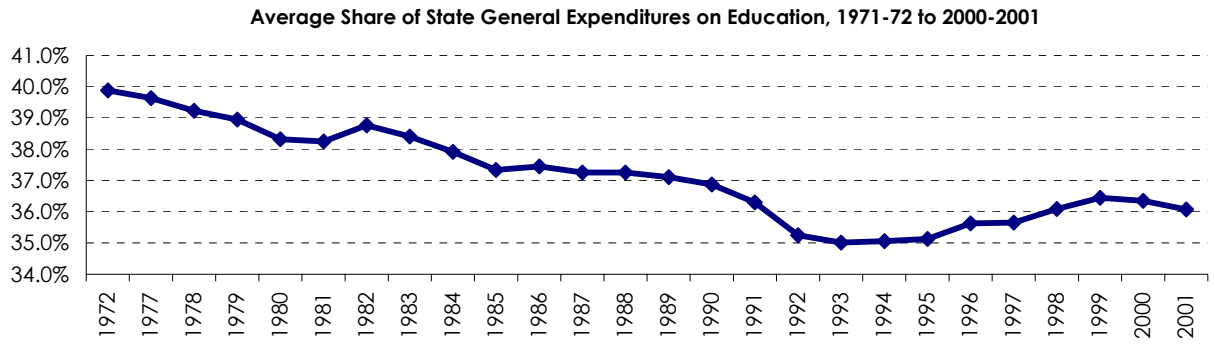
a result from the increasingly fierce competitive environment institutions are operating in. For a detailed discussion on this matter, see Ehrenberg (2000).

[5] I analyze expenditures made from state general fund budgets because this is the fund where legislatures and governors have the most appropriative discretion. This is the predominant fund for financing a state's operations. Revenues coming into the general fund derive from a variety of broad based state taxes. The trends that I present below look similar if one were to analyze total state expenditures as well. I will discuss this is some more detail later in the paper.

million public school students in each state, this represents an additional $750 of resources that could have been devoted to every single elementary, secondary and college student in a state.

Figure 2



Source: US Census "State Government Finances" Selected Years. See ftp://ftp2.census.gov/pub/outgoing/

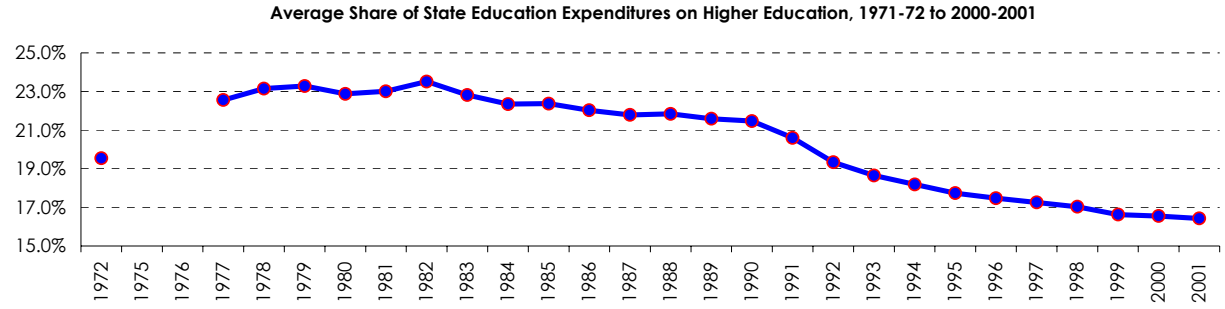
The decline in relative state support for education has occurred through the distribution of states – in those that have traditionally devoted a large share of resources to public education (North Carolina's share has fallen from 51% to 41%) and those that have not (Massachusetts' share has fallen from 30% to 22%). In fact, only 11 states have seen increases over this period, with an average increase of about 4 percentage points.

I should emphasize that there is nothing particularly sacred about education's share of the budget. The many factors thought to be responsible for its decline are well known. Medicaid expenditures have skyrocketed due to large increases in caseloads (it is a means-tested entitlement program), escalating prescription drug costs and lagging support from the federal government. An aging and growing population is putting further stress on health care expenditures and other state services. Corrections expenditures have been growing due to more vigilant prosecution, mandatory sentencing laws and the resulting expansion of prison capacity. Whether education's falling out of favor represent demographic changes alone or a shift of funding priority is unclear and is analyzed in the empirical section of the paper.

Figure 3 describes how the average share of state educational budgets allocated to public higher education has changed in the United States between FY72 to FY01. After a sharp increase in the early

70's, higher education's share has fallen steadily.[6] Since 1977, the average share of education budgets allocated to higher education across states fell over six percentage points, from 22.6% to 16.4% after peaking at 23.5% in 1982 (a 27% drop). While the most precipitous drops occurred during the recessions of the early 80's and 90's, the lush budget environment in the 1990's was insufficient to halt the bleeding.

Figure 3



Source:s US Census "State Government Finances" Selected Years and Illinois State's GRAPEVINE.

This decline occurred in the vast majority of states. States like Oregon, Wisconsin and California that initially expended well over 25% of their education budget on higher education have all cut their higher education share by over 40% (12 percentage points) while states like Vermont, Massachusetts, New Hampshire and Delaware that initially expended less than 19% of their education budget on higher education, have also cut their shares by over 35% (6 percentage points). Even those states where advances were made (only four states increased their share overall during the period) have seen much of it weathered away by the end of the period. In fact, only one state saw its higher education share increase since 1990 (New Mexico).

The average public education budget size (in 1998 dollars) in FY2001 was $7.1 billion. Had it been able to maintain its budget share at 1977 levels, public higher education in an "average" state would have received $439 million more than it actually received in 2001. Considering that average overall full-time equivalent (FTE) enrollment in public two- and four-year institutions, including all graduate and

[6] Allow me to begin the discussion of the "fall" with 1977. The rise in the early 70s can be attributed to a number of factors. Chiefly among them are states preparing for the children of the baby boomers attending college and leaving the K12 sector, accommodation of the enrollment surges as a result of the Vietnam War draft deferments and a residual effect of the space and arms race that culminated in the moon landing in 1969.

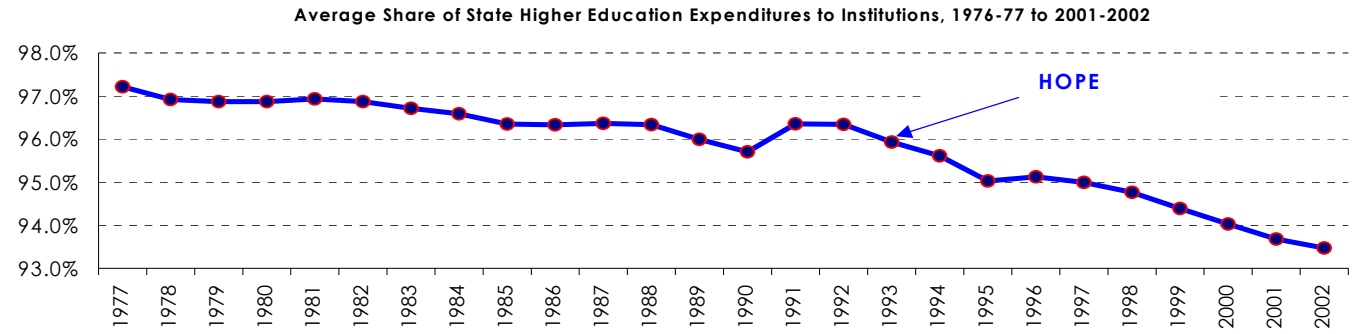
professional students, was approximately 160,000 students in 2001 (up from 125,000 in 1977), this would have meant an additional $2,744 per FTE student in support in the average state. To appreciate the magnitude of this loss, recall from figure 1 that average expenditures per student across the U.S. in public higher education in FY2001 was $16,796. Thus, the decline in higher education's share of state public education budgets represents over 16% of the cost of educating a FTE student. In fact, the monies this loss represents would have been enough to cover 83% of the cost of instate tuition at a public four year institution in 2001![7]

A further strain being placed on public higher education institutions is revealed in figure 4. Fueled by the popularity of merit-based aid programs in the 1990s, the share of higher education funding going directly to institutions (as opposed to students) declined over the period, from 97.2% in 1977 to 93.5% in 2002, with most of the decline occurring after the implementation of Georgia's HOPE scholarship program in 1993.[8] While ultimately student aid dollars make their way back to the institution that an aid recipient attends, this aid travels with the student and cannot be depended upon to support institutional operations.

[7] The Digest of Education Statistics (2001) reports that average instate tuition at all public four year institutions across the US was $3,314 in 1998 dollars. An enrollment weighted average (my calculations) suggests this figure is closer to $2,850. In addition, the "loss" alone would have been more than enough to allow institutions to keep their real tuition rates at 1977 levels, when, in real terms, weighted average four year public tuition was $1,693.

[8] By then end of FY2001, 13 states had instituted merit based aid programs similar to Georgia's HOPE program (Krueger 2001). While some states have had small merit programs for over 30 years, which were targeted to specific ethnic groups or students with specific skills, the popularity of broad based programs and their growth did not begin until Georgia's HOPE program exploded on the scene in 1993. The concurrent growth in need-based aid awards may signal that a paradigmatic shift away from broad-based in-kind aid policies is underway.

Figure 4



Source: Illinois State's GRAPEVINE and National Association of State Student Grant and Aid Programs various years.

The average public higher education state appropriation (in 1998 dollars) in FY2002 was $1.3 billion. Had institutions been able to maintain their budget share at the 1977 level, public higher education institutions in an "average" state would have received $43 million more than they actually received in 2002. Considering that average FTE enrollment in public two- and four-year institutions, including all graduate and professional students, was approximately 160,000 students in 2002, this "loss" represents an additional $270 per FTE student in support in the average state.[9]

Though the magnitude of the "loss" is far smaller than that represented in figures 2 and 3, this trend should be worrisome nonetheless. Proponents of direct student aid programs champion its cause for two primary reasons: student access and to ensure an accrual of economic benefits within a state. However, recent empirical evidence suggests that the ability of student aid programs to achieve these two goals are very limited. With regard to student access, policymakers have long feared that more generous student aid packages would encourage institutions to capture these additional revenues through higher tuition and other fees, thereby negating the impact of the aid programs. Bridget Long ('03) and Michael Rizzo and Ronald Ehrenberg ('04) provide evidence that supports this view.

With regard to economic development, there is a belief that increasing the generosity of direct student aid awards (and merit programs in particular) would both increase the propensity for students to attend colleges in their home states and also increase the propensity for these talented students to remain

[9] For comparison purposes, the real value of the maximum Pell grant awarded fell by $465 over this period.

in-state after graduating.[10] While a number of studies have found that generous student aid programs result in more talented students remaining in-state to attend college, Jeff Groen ('03) finds that although students that attend college within a state are more likely to remain in the state, the magnitude is much too small to justify using economic development as a rationale for merit-based student aid programs.

That budget shares, as opposed to levels, are a metric of interest is not driven alone by analytical convenience. Empirical and behavioral evidence suggests that legislatures behave in a way that is amenable to an analysis of shares. In prior empirical work examining levels, the only consistent interest group found to have an impact on higher education expenditures is elementary and secondary education. While empirical analyses of levels might show that the volatility in per student funding levels reflect business cycles, underlying demographic trends and the ability for public institutions to raise money from other sources, they cannot easily explain why public higher education has steadily fallen out of favor as a budgetary priority – even during robust economic times. Behaviorally, there are a multitude of examples that demonstrate that states explicitly tradeoff K12 funding for higher education funding. A recent, well publicized debate in the South Carolina Capitol in Columbia highlights such a battle.[11]

The combined effect of the trends depicted in figures 2 through 4 indicates that if public higher education institutions had been able to simply maintain their budget shares at 1977 levels, in an average state institutions would have garnered an additional $605 million per year. To appreciate the magnitude of this sum, consider that it represents fully 50% of the *total* public higher education budget in an average

[10] It is believed that areas with a more highly educated workforce have higher wage levels than other areas – and with more highly educated people earning more and therefore paying higher taxes (Moretti, 2003). It is also believed that more highly talented students are most likely to attend colleges outside of the home state and do not return upon graduating (Hoxby, 97).

[11] *Chronicle of Higher Education,* 5/24/02. In November of 2001, South Carolina voters approved a lottery to raise funds for "education" which is expected to raise $172 million annually. As the state faced a $350 million budget deficit, the Senate proposed that the bulk of the money be spent on college scholarships and endowed professorships at research universities while the House wants to focus the spending on reading, math and science programs for elementary-school pupils. House opponents of higher education spending cite the Bennett Hypothesis as a defense and that increasing college scholarship awards would only encourage colleges hamstrung by tight state budgets to increase tuition – even citing Clemson's decision in 2001 to increase tuition by 42% ($1,500) in response to a $6.5 million reduction in state appropriations as a harbinger of things to come. Even lottery revenues are uncertain lawmakers say – which just highlights the fact that overall state revenues are uncertain. They claim that scholarships and professorships are harder to eliminate in tough times than are elementary school grants – indicative of the dilemma states face in wanting to strengthen universities through these means.

state ($1.2 billion). Had states been able to retain these dollars, the $3,781 per full time equivalent student it represents would have been sufficient to cover an additional 23% of institutional expenditures or 114% of in-state undergraduate tuition at an average public four year institution in 2001. That these declines have occurred steadily, and almost unnoticeably for over 20 years means that institutions have had to adjust steadily to this reality for over 20 years.[12]

The remainder of this paper presents empirical estimates of the determinants of changes in the three budget shares within each over the 1972-2001 period. The estimates are generated from reduced form equations derived from a model of utility maximizing behavior of state government officials this model and its implications are discussed in section III after I briefly discuss prior research in the next section. Subsequently, section IV describes the data, while section V presents my econometric findings. Finally, section VI concludes.

II. Challenges in the Public Higher Education Finance Research Environment – Prior Research

Given that public higher education is one of the largest budget items in a state, the dearth of economic research (both empirical and theoretical) devoted to its determinants is surprising. The few empirical pieces that have been completed have yielded little in the way of policy relevance as very few explanatory variables have been found to be statistically significant. In fact, the most consistent finding across studies is that findings are inconsistent and that more analysis is needed. The sparseness of theoretical treatments derives from two important realities.[13] First, due to the large number of interested agents and competing factors at the state level, a single model of state budget determination has proven to be elusive. Second, the awkward economics of the higher education process itself make modeling

[12] It must be emphasized that the national averages presented in figures 2, 3 and 4 above are not driven by any one particular state or group of states. Appendix figure 1 combines the information in these figures to present, for each state, the share of general fund expenditures directly allocated to public higher education institutions from 1977-2001. The steady declines are remarkably similar across all states. Even in states where there had been some recovery during the mid-1990s (California, Louisiana, Florida, Massachusetts), the budget shares never returned anywhere near their initial levels, and began to fall again as the economy turned south in 2001.

[13] All of the papers that I have seen treat the higher education funding process in a partial equilibrium framework. That these treatments are necessarily simplistic may be contributing to the dearth of significant findings in the literature. More complete computable generate equilibrium (CGE) treatments are still in their nascent stages. The top researchers in this area (Tom Nechyba, Dennis Epple, Richard Romano and Holger Sieg to name a few) are only beginning to turn their attention to the higher education sector.

institutional behavior and pricing extremely tricky.[14] The coupling of these factors make modeling public higher education at the state level a daunting task for theoretical economists and an analytical morass for empirical researchers. Below, I outline some of the general difficulties and common threads in the public higher education finance literature.

No universally accepted model of state expenditures exists. The most common assumption is that funding decisions are decided under a median voter framework[15] in order to general empirical tractability, though a variety of other models have been employed.[16] Little consensus has been reached on a number of additional salient issues, which has contributed to the dearth of significant empirical findings. Researchers have been unable to agree upon the proper measurement of higher education funding – using higher education appropriations in levels, in per student terms, per capita terms, per voting-age population terms, and even annual percentage changes in the levels. Nor has a consensus been reached on the proper unit of analysis, with some researchers focusing on the states, while others use institutional level data for all public institutions, all public research institutions, or even a single public research institution over a long time series. Further, higher education finance researchers have differed widely in their objectives. Many set out to test whether specific theories of legislative behavior apply to higher education while others intend to find whether statistical relationships between particular variables exist (for example, between public tuition and state aid for education, between state aid and enrollments, between migration and state aid, and many more).

Data availability is a significant constraint. Due to the difficulty of assembling a panel data set on state level variables, a majority of studies used cross-sectional analyses.[17] There is nothing inherently "wrong" with doing this, but there are three points worth noting. First, due to the very small number of

[14] Rothschild and White (93) analyze the difficulty in writing down an economic model of higher education. The most significant challenge lies in the fact that the major inputs in the production process (students) are also the primary consumers of the output of that process.
[15] The work of Borcherding and Deacon (72), Clotefelter (76) and Peterson (76) falls squarely in this category.
[16] Cohen and Noll (98) and Hoenack and Pierro (90) are good examples of competing interest group studies while Clotfelter (76) and Strathman (94) include measures of out-migration in their regressions to represent a state's ability to capture benefits from investments in higher education in a human capital motivated model.
[17] Very little state data on demographics, budgets, economic conditions, etc. are found in a single source. In addition, even as we speak, most of the data one would need to do a detailed budget study have yet to be put in easily retrievable electronic form.

degrees of freedom, cross-section econometric models that use state level data are forced to be parsimoniously specified. Even in cases where relationships exist in the underlying population, there may not be enough variation in such a small sample of data for it to be realized statistically. Second, cross-sectional estimates tell us why higher education funding levels differ across states, they do not provide any information on how changes in various factors have affected changes in funding within any given state. Third, omitted unobserved state-specific, time-invariant variables may lead to biased estimates if they are correlated with the included variables.

Endogeneity issues also create particularly difficult problems for researchers. The level of state funding for higher education likely affects a number of factors thought to also affect funding levels, in particular enrollments and prices. For example, if higher state support translates into higher enrollments, then estimates of other parameters in a model that includes enrollments as an exogenous determinant of state funding would be biased upward if they are correlated with enrollments.[18] In addition, state institutions themselves may be endogenously determined. For example, legislators in states with a higher education funding formula may react differently to changing economic and demographic climates than those in states without them or states that operate on a biennial budget cycle may behave differently than those on an annual budget cycle. It is likely that budget cycles and funding formulas are a result of prior spending habits in the states. With very few exceptions, the literature does not recognize these complications.

The multitude of difficulties described above has forced the empirical work on higher education finance in the literature to be largely atheoretic. While the models I estimate below are also reduced form analyses, I carefully address each of the above challenges. Finally, prior research has not considered an analysis of the determinants of the *shares* of state budgets allocated to higher education. That is, there has been no empirical work done to explain why higher education has fallen in priority at the state level. My focus on explaining these budget share outcomes allows me to sidestep the difficult decisions of choosing

[18] While Clotfelter (76) and Toutkoushian and Hollis (98) attempt to correct for the fact that enrollments are likely determined by the level of state support, many papers simply include enrollments exogenously on the right hand side of their regressions, or ignore them completely.

which behavioral model to subscribe to and the relevant measure of state higher education expenditures, and it also provides me with a logical set of restrictions to place upon the underlying structural demand system.

III. A Simple Model of State Decision Making

a. Theoretical Model: The Utility Tree

The empirical estimates I present in the next section are derived from a simple application of the classical theory of consumer choice to collective decisions made at the state level that determine expenditures for various categories of public services. Broadly speaking, such a model requires that a utility function exists that can logically describe the preferences of some effective decision making agent(s) over a bundle of public sector and private sector goods and services.[19] The agent is assumed to choose expenditure levels for the various categories to maximize this satisfaction, subject to the constraint on total resources in the state. However, in order to estimate any demand functions that result from this process, there are two major issues that I must confront.

First, it is not entirely clear who the single decision making agent within a state is. The public finance and political economics literature contain hundreds of studies aimed at determining just whose preferences are being maximized by the aforementioned utility function, with absolutely no consensus reached. Since it is the legislators who ultimately cast budget votes in statehouses, I abstract from the countless interest groups and decision-making entities within a state and consider them as the single optimizing agent, though there is nothing sacrosanct about this selection.[20]

Second, I need to describe the process by which the optimum amounts of expenditures on each of the available public and private goods and services are chosen by this representative agent. The legislature will maximize its utility by allocating expenditures to the various categories of public services

[19] By logically, I mean that the preferences are rational and that the function describing these preferences is well-behaved.

[20] It could very well be that a median voter is the effective decision maker, but it may also be any number of other entities. For instance, in many states the governors have substantial powers to cut line items from budget bills, can veto entire budgets, etc. As I am interested in understanding what specific factors determine education budget outcomes, whether my empirical results are consistent with any underlying theory is of secondary importance.

until the marginal utility generated by that public service equals the marginal utility they receive from wealth times the price of that service, taking the total available resources in the state and the prices of all of the various services as constraints. Without imposing any structure at this point, the resulting demand equations are virtually inestimable since the demand for any one service will depend upon the prices of *all* of the services in the system.

That the legislative demand for a particular public service in an unconstrained structural model depends on a large number of prices presents a number of challenges. Even if prices for the various public services were easily obtainable,[21] the data requirements for empirical estimation on a sample of only 50 states are simply too demanding.[22] It is also likely that a vector of prices, if found, would be highly collinear – making it unlikely that all could be included in a single demand equation. Further, in the event that all prices could be included, concerns about endogeneity and interpretation need to be addressed.[23]

In order to generate an empirically tractable model, I need to impose some behavioral structure on the legislatures. Following the lead of Strotz (1957) and subsequent application by Ehrenberg (1973) and others, I employ a "utility-tree" approach. Rather than assuming that legislatures allocate resources to

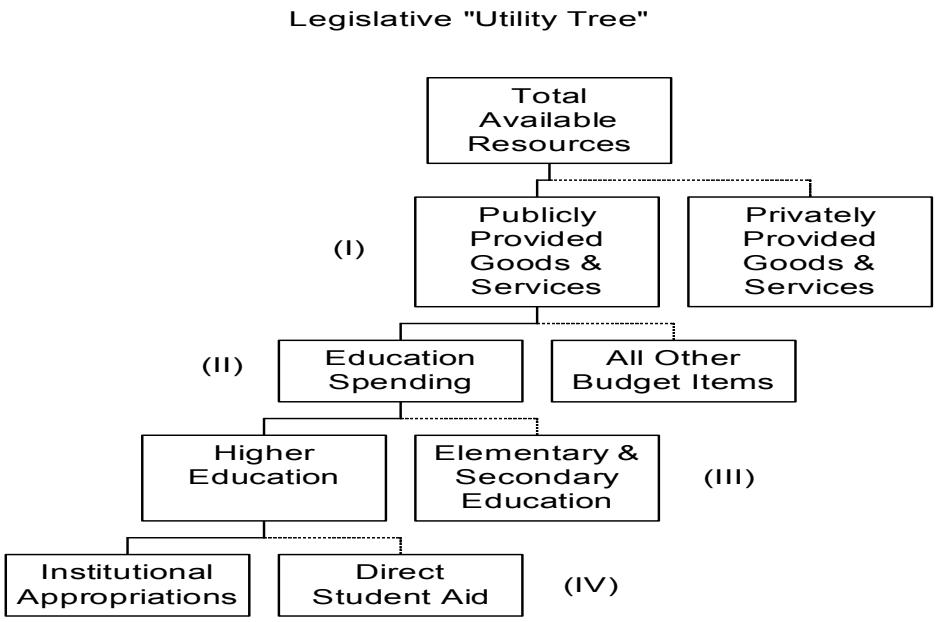
[21] Determining a single price for any one aggregate budget item is an extremely difficult task. For instance, what is the proper measurement for the cost of road maintenance in a state? Is it the wages paid to construction workers? Or the per-capita cost of the machinery used to pave roads? Or the cost of the administrators in the capital making decisions about road construction? Something else? The task would be easier if I were analyzing state expenditures at a more disaggregated level – for instance, in studies of public employment, the relative prices are the wages in each employment category.

[22] Too demanding in two respects. First, it is not inconceivable that a state spends money on more than 50 budget items. In this case, there simply aren't enough degrees of freedom to include the prices of all 50 budget items in a demand equation with only 50 observations. Second, it is simply not plausible that all prices *directly* affect the demand for all budget items. For example, would anyone believe that an individual decision maker considers the increase in the price of highway paint when determining scholarship awards to top high school achievers in science? The number of choices confronted by our representative agent is overwhelming in this unconstrained framework.

[23] In terms of endogeneity, it is not unimaginable that the level of state expenditures for a budget item affects the measure "price" of that budget item. For example, if the price of higher education is measured by faculty salaries, it is also likely that public universities can increase faculty salaries more when state funding is higher. In terms of interpretation, many prices likely reflect quality, so it would be difficult to disentangle changes in quality and changes in technology from changes in the actual cost of providing a service (e.g. think medical advancements). Instrumenting for prices, or controlling for technology and quality is not a simple task. In estimation, the quality component seems to dominate the cost component, making inference difficult (see Clotfelter '76 for an example).

budget items in a single step, I assume that legislatures follow a multi-stage choice process. Figure 5 graphically depicts this choice process.

Figure 5



Legislatures will optimally follow this multi-stage process only if I make a critical assumption that the utility function represented in each stage of the budget process is *strongly* separable. Intuitively, this assumption means that in each stage of the budget process, the legislature considers only the budgeted expenditures and prices of specific goods *for that stage alone* when allocating funds to specific categories. Formally, this assumption requires that the marginal rate of substitution between different categories of goods and services within a budget category, are independent of consumption levels of goods and services outside that category.

To illustrate, if I can bundle all public education expenditures into one group and non-education public expenditures into another (level (II) above), the legislature can rank different spending bundles within public education with a well defined ordering which would be independent of the level of public provision of budget items outside the group. Thus, legislative preferences between public higher education and public elementary and secondary education are independent of spending on corrections,

Medicaid, welfare, and anything else outside the education group.[24] Each group is said to have a sub-utility function with the values of each sub-utility function adding up to yield total utility to the legislature.

A complete description of the process begins with branch (I) on the "tree." The legislature derives utility from both publicly and privately produced goods and services, which can be written as:

$$U = U\left[V^1\begin{pmatrix}\text{publicly provided}\\ \text{goods \& services}\end{pmatrix}, V^2\begin{pmatrix}\text{privately provided}\\ \text{goods \& services}\end{pmatrix}\right]. \qquad (1)$$

The legislature is constrained by the total available resources in the state, which include all tax revenues per capita, per capita personal income and transfers from the federal government.[25] The split between private and public goods provision is implicitly decided by the determination of the tax code. Strong separability imposes that the utility the legislature derives from the provision of any publicly provided good or service is independent of the level of private goods and service provision. More formally, the marginal rate of substitution between any two publicly provided goods is unchanged by a change in a privately provided good or service. It is at this top level of the tree that the separability assumption is most tenuous. Among other things, it implies that funding decisions between public education and public health care should not be affected by the level of private expenditures on education and health (i.e. strong separability is not a great assumption if goods and services produced in the public sector have valid private substitutes).[26]

Given the budgeted expenditure on public goods and services determined by the process in (1) above, the legislature then budgets for each of the various categories of publicly provided goods and services (education, corrections, health care, transportation, etc.) based only on this income and aggregate price indices for each category. The branch sub-utility function, V^1, is a function of public education

[24] As Deaton and Muellbauer (1980) point out, there is "no reason why each sub-utility function could not have one or more deeper sub groupings within it, nor should we rule out the possibility that some sub grouping may only have one unit." Thus, the categorical groupings in figure 5 are elastic. As I describe in more detail below however, the validity of this assumption depends on which level of the utility-tree I am analyzing.

[25] I will assume that all grant aid is fungible (though block grants from the federal government are becoming a rarity).

[26] V^1 would also include any publicly purchased, but privately produced goods and services.

spending and spending on all other goods and services and can be expressed as:[27]

$$V^1 = V^1\left[Z^a\begin{pmatrix}\text{education goods}\\ \&\ \text{services}\end{pmatrix}, Z^b\begin{pmatrix}\text{all other state provided}\\ \text{goods \& services}\end{pmatrix}\right]. \qquad (2)$$

Strong separability in (2) imposes that the utility the legislature derives from the provision of any education good or service is independent of the level of other public goods and service provision. More formally, the marginal rate of substitution between higher education and elementary and secondary education is unaffected by a change in any other publicly provided good or service. The restrictions placed on preferences in this branch of the utility function are less objectionable than in (1). For example, an increase in the cost of road construction should not affect the share of education dollars allocated to higher education, wealth constant.

Moving "down the tree", the legislature is assumed to derive utility from each of the various categories of publicly provided education goods and services. I am focused on two particular categories, higher education (HE) and elementary & secondary education (K12).[28] In this step of the process, legislatures maximize utility subject to the budgeted expenditures on public education decided in (2), and only the relative prices of HE and K12. The branch sub-utility function, Z^A, is a function of only HE and K12 and can be written as:

$$Z^A = Z^A\left[\theta^1\begin{pmatrix}\text{higher}\\ \text{education}\end{pmatrix}, \theta^2\begin{pmatrix}\text{elementary \&}\\ \text{secondary education}\end{pmatrix}\right]. \qquad (3)$$

Strong separability in (3) imposes that the utility the legislature derives from the provision of any public higher education good or service is independent of the level of K12 provision. More formally, the marginal rate of substitution between funding categories *within* higher education (for example, between

[27] Note, the analysis would be unchanged by separately budgeting for all other state items at this level. Grouping them into one allows me to use a composite price in the empirical analysis as opposed to finding prices for each particular budget item. As you will see, the pricing doesn't much matter in the empirical results that follow as I try to account for other public budget items by including variables that affect state preferences for these items, aside from prices. This isn't too objectionable. Educational services make up nearly half of state payrolls and it is plausible that educational services satisfy wants independent of non-educational services.

[28] Since I am focused on higher education's share of the total education budget, included in K12 expenditures are actually all dollars spent on education that are not higher education institutional appropriations or student grant aid. Therefore, the K12 expenditures include funding for special education, for programs like New York State's BOCES, etc.

student grant aid and institutional appropriations) is unaffected by a change in the level or price of K12 provision. While the restrictions placed on preferences in this branch of the utility function are less objectionable than in (1), they may still cause concern. For instance, a decrease in the cost of high school advanced placement instructors is assumed to have no affect on the share of higher education dollars allocated to fund student grant aid programs.

The lowest branch on the tree indicates that the legislature derives utility from each of the various categories of publicly provided higher education goods and services. Legislatures allocate higher education dollars in two ways. First, they may award money directly to the institutions – these dollars are typically referred to as state appropriations. Second, rather than providing an across the board subsidy to all students, they can use more targeted programs (both means-tested and merit based) of direct student aid, which I will refer to simply as grant aid. The branch sub-utility function θ^1 can be written as:

$$\theta^1 = \theta^1\left[\psi^A\begin{pmatrix}\text{institutional}\\ \text{appropriations}\end{pmatrix}, \psi^B\begin{pmatrix}\text{grant}\\ \text{aid}\end{pmatrix}\right]. \qquad (4)$$

The split between state appropriations and grant aid will be constrained by the total allocation to higher education determined in (3) and the relative perceived prices of grant aid and state appropriations. Note that the estimation of the within branch allocations in this model depends upon the separability imposed in the branch above it. Since the split in (IV) is as far "down the tree" as I am interested in exploring, I do not need to place additional restrictions at this level.

b. Justification

As alluded to above, the utility tree approach is attractive due to its analytical convenience. Since I cannot rely on an external factor such as prices to naturally group commodities, I look to preferences themselves to provide a natural structuring. I emphasize that these restrictions were not made solely to suit the data. Rather, in the higher education setting, this preference structuring is quite natural and is supported by both legislative behavior and prior empirical research.

Abstracting from the many examples across the 50 states, in Alabama there was a recent explicit debate as to whether the shortfall in the education trust fund should be borne equally by K12 or higher

education or simply all of it should be borne by the latter. Nearly 50% of the states cut higher education appropriations midway through the 2003 fiscal year, leaving other budget items untouched.[29] Further, as of the summer of 2003, only six states spent any money on direct institutional appropriations to private schools, and in very small amounts at that.[30]

In addition to the behavioral evidence, empirical work provides support for the separability assumption. Very few papers have found any evidence that competing interest groups affect higher education when higher education is modeled as a separate budget item at the state level (e.g. Hossler, et al '97, Lydell and Lyddon '97). A recent paper that does find some evidence, Toutkoushian and Hollis ('98) indicates that the only competing interest group that seems to affect higher education appropriations is K12. In fact, the broader public finance literature rarely (if ever) considers higher education as a separate budget item when analyzing demand at the state level (Painter and Bee '01, Poterba '97, Ashenfelter and Ehrenberg '75, Ehrenberg '73 to name a few).[31]

C. Empirical Model

In order to explain the budget share outcomes depicted in figures 2-4, I move to a multivariate analysis. I estimate three equations using panel data, with the state-year as my unit of analysis, in which the share of the public general fund budget allocated to education (in state *i* and year *t*), the share of the education budget allocated to higher education (in state *i* and year *t*) and the share of the higher education budget allocated to institutions (in state *i* and year *t*) are specified to be functions of the total available resources in that branch, demographic characteristics, enrollment pressures, economic conditions,

[29] *Chronicle of Higher Education,* 6/05/03.

[30] NY, MD, IL, MI, MN and PA – data from Integrated Postsecondary Education Data System Peer Analysis System via National Center for Education Statistics website. In fact, the aid is not in the form of block grants to any institution, but rather is a function of resident and nonresident enrollment and graduation rates. In the state with the largest private expenditure (Maryland) the largest allocation goes to Johns Hopkins, where state appropriations make up only 1% of their operating budget.

[31] As Ashenfelter and Ehrenberg (1975, p.62) point out about multi-stage budgeting: "although this description of the consumer's budgeting process seems generally plausible, it has special appeal for the problem of allocation within and to the public sector. In this decentralized budget process, there is no reason why the detailed choices of purchases within a broad category need be made by the consumer at all … … these are, however, precisely the types of information that elected officials are expected to have; indeed, it is presumably the reason for their election. The framework we set out for economic choices is thus consistent with the existence of a role for the political process."

competing interests in that branch (including private alternatives), political factors, state institutional characteristics and random error terms.

The education budget share (EDSHARE) is assumed to result from the maximization of equation 2, subject to the budget constraint in that branch (a function of potential total tax revenues collected, prices and any transfers from the federal government). The higher education share of the education budget (HESHARE) is assumed to result from the maximization of equation 3, subject to the total dollars allocated to the education sector from the EDSHARE equation. The institutional share of the higher education budget (INSHARE) is assumed to result from the maximization of equation 4, subject to the total dollars allocated to the higher education sector from the HESHARE equation. My empirical specification of equations 2, 3 and 4 depends on the separability of utility in equations 1, 2 and 3 respectively.[32]

An outgrowth of this key assumption is that different relative price variables enter into the different levels of the model. All of the "other prices" are captured by the inclusion of a wealth measure in each equation. In other words, all budget items outside a branch are assumed to only have an income effect, and zero cross-substitution effects, with budget items within the branch. Only budget items within a particular branch are assumed to have non-zero cross-substitution effects.[33]

The empirical model should be thought of as reduced form, rather than structural, in two ways. First, despite my intention to model legislative demand, variables included on the right hand side of each equation may also capture supply factors. Therefore, the estimated equations likely represent equilibrium conditions in the underlying structural demand and supply model. Second, even if the included explanatory variables capture demand factors alone, the empirical specifications should be viewed as

[32] I don't specify the form of the utility function beyond the separability notion. Though I'd like to estimate as flexible a form as possible, lack of information on prices and a smallish data set do not permit this.

[33] Imposing such a structure on my model is not without faults. The elimination of substitution effects from changes in prices across branches may not such a horrible assumption for some branches, but it may do violence to common sense in others. For example, an increase in the price of health care is assumed to not have a substitution effect on the amount of K12 vs. HE spending in a state. However, if the state universities are all medical colleges and undergraduate nursing schools, this is surely a reprehensible assumption. The only change my structure allows is that an increase in health care prices generates an income effect that would be captured by the size of the education budget being smaller.

approximations to the underlying demand functions that would be generated from maximization of equations 2-4 given appropriate budget constraints.[34] Since I am interested in a determination of outcomes, the former is of greater concern than the latter.

Nonetheless, empirical estimates should be interpreted with caution. For example, it might be difficult to assess whether my results in the EDSHARE equation arise from differences in legislative demand for educational spending, or differences in the technology of supplying educational services to states with different demographic characteristics. It might seem reasonable to exclude the ethnic share of the population from the education production function – which suggests that the demographic effects associated with these variables are likely to result from demand side factors alone. Interpretation of the effect of fluctuations in the school-age population is more difficult, for example, because economies of scale in education could make it possible to deliver the same education to a larger cohort with a less than proportional expansion in education spending.[35]

Since many state level demographic, economic and other variables are highly correlated, and because of the limited size of my sample, my estimating equations must be parsimoniously specified. I take a heuristic approach in determining a baseline model from which to begin my analysis. Below I describe the variables that are common to all three equations.

Variables Common to All Three Equations – Baseline Model

Measures of wealth (INC) and its square (INC2) are included in each regression not only to represent a state's financial ability to provide public goods and services, but also to capture the income

[34] In actuality, legislatures choose expenditure levels, not budget shares. However, shares are implied by this choice. My model should be viewed as reduced form approximations to the true expenditure model because I do not derive these budget shares formally.

[35] Since the "amount" of higher education services captured by voters is not observable, but expenditures are, it may be necessary to model the production side of the market for public higher education services. It would be extremely difficult to formulate a model of institutional supply however. State higher education is not likely to be produced efficiently (meaning that individual schools deliver services at minimum cost). Measuring higher education outputs is also notoriously difficult. Quality is an important output, but how can one effectively measure it? If a state focused on measured tangible outputs, universities might focus on minimizing quality and maximizing some tangible output, but this is at odds standard models of prestige maximization. So, what I do above should be viewed as a partial equilibrium analysis.

effect of prices that have been excluded because of separability.[36] Therefore, the wealth measures in the EDSHARE equation also capture the impact of changing prices of private goods in the branch above it. The wealth measures in the HESHARE equation capture the impact of changing prices of other public budget items such as corrections, transportation, etc. from the branch above it. Similarly, the wealth measures in the INSHARE equation capture the changing price of K12 education.

There is no requirement specifying that higher education is a normal good in the eyes of the legislature. When income increases, one might expect holding all else constant, that state support for higher education increases; however, there may be a perception among legislators that as economic conditions improve (and income increases), that individuals are better positioned to pay their own educational costs. In fact, previous research on state support for higher education budgets (in levels) has been inconclusive about the role of income. While work by Borcherding and Deacon (72), Strathman (94) and Goldin and Katz (99) find that higher education is a normal good, Clotfelter (76), Coughlin and Erekson (86) and Hoeneck and Pierro (90), find no significant impact and Toutkoshian and Hollis (98) even find some evidence that higher education is an inferior good. Further, theory does not indicate how budget *shares* will react to changes in state income, and its impact is left as an empirical exercise.

Preferences for different public goods is likely to depend upon the *distribution* of income within states. For instance, states with income distributed tightly around the mean might be expected to support public higher education due to the large subsidy that would be available to the middle class. States with wide income dispersion may be less likely to support higher education because wealthy families are more likely to pursue private alternatives while less fortunate families may prefer scarce resources be allocated to other public goods (for instance, for public transportation).

On the other hand, it may also be the case that states with more unequal distributions tend to over-support higher education. Fernandez and Rogerson (95) determined that increases in the level of

[36] As I will discuss in the results section, I test a variety of different specifications for many variables in each equation, which is why I do not specify a definition for many items here. For instance, I analyze three different wealth measures in my regressions: median household income in the state, state tax revenues per capita and real gross state product per capita. Median income is preferred because it is less likely to be affected by state tax policies or other state institutional characteristics.

income inequality make it more likely that poorer individuals are excluded from obtaining an education and that their tax payments help offset the cost of education obtained by others. This echoes much of the early research on the distributional impacts of higher education such as that done by Hansen and Weisbrod. If it is the case that the structure of state higher education systems effectively redistribute income to the upper- and upper-middle class, then one expects to find states with wide income distributions disproportionately supporting public higher education. This issue has been studied in the development literature as well. UNESCO (03) reports a concern that in countries where income is very unevenly distributed, investments in higher education may exacerbate any inequalities that are already there. Further, they express a concern that "These challenges include both ensuring that educational opportunities are equitably distributed at all levels of schooling and that the expansion of higher levels of education does not come at the expense of maintaining good-quality primary education." I include an ordinal measure of the income distribution in each regression, measured by the ratio of household income for people at the 75th percentile of the income distribution to those at the 25th percentile (INEQU).[37] I also include an interaction term between the income level and income distribution (INCINEQU) to capture the differential impacts of income dispersion on education budget shares in wealthy versus poorer states.

Each of the regressions also include measures of a variety of demographic factors.[38] If a particular demographic group places substantial demands on the public sector, and this raises non-educational government spending, then the shadow cost of funds for education spending will rise, and this spending program is likely to contract. It is also possible that certain groups do not place high priority on spending for education or higher education. In this case, jurisdictions where these voters are more important will spend less on education as a result of the different tastes of their voting population.

[37] I am limited by the CPS data in how I measure income inequality. My dissertation also analyzes the impacts of including different order statistics, such as the 90-10 ratio, the 90-50 and the 50-10.

[38] Median voter models say that demographic variables should not affect state expenditures unless they affect the preferences of the median voter. Despite this, many spending demand studies include demographics by claiming that they shift the level of spending that is needed to achieve a given level of output, rather than the political support for such spending.

Discrete measures of the population age distribution are included to capture the competing demands of different cohorts within a population. For instance, college and K12 aged children and their parents are likely to support education, while the older population (in the absence of preferences for intergenerational transfers), would tend not to. Some of the costs of public higher education inevitably fall upon households that do not receive any direct benefits from these services. For example, elderly households pay sales taxes that are used to finance appropriations. Elderly residents are unlikely to attend college and K12 schools, or have children who attend either, but do benefit a great deal from other state programs such as medical expenditures and public transportation. One would then expect to find a negative effect of this variable in the first two equations and a positive impact in the third.[39] However, what is not understood is how changes in the share of the population that is aged is likely to affect higher education funding. The rising number of elderly in a state may result in an increase in federal transfers in a state and the elderly may wish to support the education and training of state residents to expand the pool of money from which federal dollars can be redistributed and also to raise the quality of services received in that state.

Measures of the racial composition within a state are included to test whether racial mix affects support for public spending, but they might also proxy for higher moments of the income distribution that I may not have captured properly, such as the fraction of households with low income levels or the demand for other public budget items (e.g. many lower income families reside in large cities and this may increase the demand for public spending on transportation).[40] A key related explanatory variable is how the racial composition differs across different age cohorts. Independent of a group's own preferences for a public good, they may be more or less willing to support funding for a good benefiting another cohort because members of that cohort "look like them."

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[39] If there is a relationship, I would expect the elderly population to support institutions rather than students in the INSHARE equation because in many communities the institutions provide services to the general population to take advantage of.

[40] An explicit measure of urbanity could be included to capture the differences in the cost of delivering school services as well as the differential preferences for school services between urban and rural residents. This variable was highly collinear with unemployment and the racial composition variables and is heretofore dropped from the analysis.

Out- and in-migration measures are also included. Rates of return to education by states depend upon the fraction of the people a state educates that move out of the state and the impact of state expenditures on the migration of educated people. In other words, legislative demand for university instruction depends on the discounted future benefits from investing in human capital, which are lower in states with significant out-migration (OUTMIG - the state can no longer capture the positive externalities and future tax payments from educating a resident). In addition, the form of the state subsidy for higher education would likely depend on the location decision of university graduates. More targeted student aid programs may engender loyalty in residents that broad based appropriations may not be able to accomplish.[41] I include the level of in-migration (INMIG) because higher education spending may not represent a fixed benefit to those directly being educated, and may in fact affect the decision to move to another state.[42]

Different measures of the unemployment rate are included in all three equations (UNEMP). In the EDSHARE equation, unemployment rates capture the competing interest for welfare funding and other social programs in a state. In the HESHARE and INSHARE equations, changing unemployment rates reflect changing student demand for particular higher education services. As economic conditions worsen, the opportunity cost of attending a university falls, but so too does a student's ability to pay.

Variables Specific to Each Equation – Baseline Model

The EDSHARE equation includes a measure of the relative price of educational services (EDPRICE). This relative price is calculated as the weighted average earnings of public K12 and higher education instructional faculty divided by the average earnings of non-educational public employees in a state. While relative cost increases lead to decreased demand, the impact on expenditures and budget shares is a prior indeterminate. The empirical impact of pricing is also clouded by endogeneity concerns.

[41] Groen and White (03) find that attending a public university increases a marginal in-state student's probability of locating in the state after graduation by more than for similar nonresidents. However, the marginal instaters earn less when they stay than do the nonresidents and hence pay less in taxes. The former effect is larger – so states should prefer residents. However, nonresidents pay higher tuition – which they find more than offsets the tax losses mentioned above.

[42] Strathman (94) finds strong evidence that out migration proxies for benefit spillovers in higher education funding, but no evidence that in migration affects higher education funding.

Implicitly my model assumes that legislatures are free to purchase as much education and other public goods as they want without affecting the price; the only manner by which education expenditures can vary is via shifts in the demand function or through variation in prices that shift supply curves vertically. This means that the quantity of education services demanded will primarily change expenditures as opposed to the quality of services delivered. However, the salaries that are paid to K12 and higher educational instructors are clearly a function of the level of state support provided, and higher salaries likely reflect higher levels of educational quality as well.

While the relative price variable intends to capture the (combined) effects of competing budget items in this branch of the utility tree, I also include non-price measures that reflect the demand for the largest remaining budget items in the states. The demand for medical services (HEALTH) is measured by a variable interacting the national health care consumer price index with the share of the population in each state that is 65 years old or older.[43] The demand for correctional facilities and services is proxied by the crime rate (CRIME).[44] To control for the impacts of the private sector, I include the share of full-time equivalent enrollments in higher education that attend private institutions (HEPRV) and the share of K12 enrollments in private institutions (K12PRV). Families that send their children to private schools may oppose the use of their tax dollars to support public education. These variables may also capture the importance of historical factors on public education provision.[45]

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[43] Medicaid is a medical assistance program for those who have no other means to pay for necessary medical care. Entitlement is based upon need alone. While Medicaid is operated primarily by the states, the federal government, reimburses 50-80% of the funds paid out by a state for Medicaid, as long as the state complies with requirements in the federal Medicaid statute regarding services, eligibility, estate recovery and other matters. There has been concern in recent years about reductions in federal reimbursements, which is but one reason why Medicaid expenditures have grown the fastest of any budget item. Inasmuch as 10% of Medicaid participants are in the 65 year old and older demographic and 46% are dependent children under age 21 (www.stateline.org), I'd like to include an interaction for the latter. However, I cannot get demographic data by this age grouping. In the future I hope to find participant data by state to include in the regressions.

[44] The crime rate is calculated as the number of murders, rapes, robberies, assaults, burglary, larceny and motor vehicle thefts per capita. Admittedly, this measure may also be affected by the level of expenditures for corrections, but less so than other measures, such as the number of prisoners in a state.

[45] Goldin and Katz (99) show that state funding for education in a given year is a negative function of private enrollments in previous years. Their paper details the historical influences on public higher education provision that are likely to be captured by these share variables. For example, Massachusetts may not need to provide as much public education services as Arizona because of the large private infrastructure that has been there since the birth of the nation.

Currently 24 states have had their K12 education finance system shifted toward more centralized funding as a result of court mandated reforms (to equalize spending across districts). With court decisions pending in many more states, this clearly is an important determinant of state education budget shares. Fernandez and Rogerson (98) constructed a dynamic, general equilibrium model of public education provision, calibrated using US data, to determine that moving from locally to state financed K12 education leads to both an increase in average income in the state and the share of income spent on education. A secondary analysis in a seminal paper by Murray, Evans & Schwab (98) estimates that a court ruling in a state caused a 23% spending increase on K12 education.[46] However, they find no evidence that states reduced funding of other budget areas in order to offset this increased spending on K12 education. Though my analysis is not as rigorous as theirs, it is worth turning attention to since the number of states that have had their K12 systems overturned since the time their paper covers has doubled (there were 12 in 1992).

I capture the effect of court-mandated equalization of K12 financing by including a dichotomous variable equal to one in state-years with a mandated reform and zero otherwise (COURT). There are two important considerations. First, the court decisions in each state are very different and this measure does not capture differences in reforms across states. My estimates therefore reflect the average effect of court decisions, but cannot capture the effects of any particular decision. Second, whether a state was ordered to reform its finance system may have been a function of low previous levels of state support. Inclusion of state fixed-effects may alleviate some of this concern and will allow me to estimate the impact of a program on a state's budget share as it moves from being a non-reform state to being a reform state.

Finally, per capita transfers from the federal government (FEDTRAN) are included because they expand the budget constraint for public sector goods and services.[47] These transfers are not included in

[46] Their intention was to determine whether court mandated reform resulted in the stated goals of equalizing expenditures across districts within a state.

[47] There is a large public finance literature studying whether these dollars replace state dollars or whether the presence of federal dollars causes state expenditures to expand (i.e. the "flypaper effect"). I will not address these issues in this paper. M Poterba (94) finds evidence that increasing federal generosity does not result in significant state expenditure increases, and only small state tax decreases.

lower branches of the model because their impact is captured by the expenditure decision in the branches above it.

The HESHARE equation is similarly specified. However, the variables relating to non-educational budget preferences and resources are excluded because separability implies that the only factors affecting the higher education – K12 funding decision are the relative prices of each and the total level of expenditures allocated to education. The price variable that is now included (HEPRICE) is calculated as the ratio of average earnings of public higher education instructors to the average earnings of public K12 instructors in a state. As with the EDSHARE equation, endogeneity of the relative price measure is a concern.

The bottom branch of the utility tree describes the INSHARE equation. Since separability implies that K12 funding factors should not influence the share of higher education budgets allocated to public institutions, I exclude the K12 court decision dummy and the share of K12 enrollments in privates. There is no price variable in this equation however, because it is not clear what the "prices" of higher education institutions and students are. The baseline specification for this model also includes variables that capture the composition of enrollments and student characteristics within a state, and other higher education specific variables – though endogeneity may be a small concern with some of them.

While it is not theoretically clear why states would prefer one form of financing to another, student grant aid awards are more visible than broad based in-kind aid policies. Further, states may believe that they are better able to retain top talent through generous grant aid programs. The average SAT score in a state is included (SAT) and is expected to be negatively correlated with the INSHARE, as states are likely to use grant aid awards to retain top talent.[48] The share of full-time equivalent public enrollments that attend two year institutions (TWOYEAR) is included as is the number of PhDs relative

[48] As Caroline Hoxby (98) has pointed out, American higher education has experience a dramatic change in market structure during the last 60 years. In 1949 about 93% of all undergraduate college students attended college in the state in which they went to high school, this figure fell to about 75% by the mid 1990s, and among other factors has been driven by the increased competition for top students at the national level. Rizzo and Ehrenberg (04) find evidence to suggest that flagship public institutions enroll nonresident students in an effort to augment quality.

to the number of bachelors degrees awarded at public institutions in the state (PHDBA).[49] Each is included to represent student demand for financial aid. Two year institutions are low cost and largely funded through local taxes, with states facing lower demand for need-based aid awards. Graduate students (especially in the sciences) are often sponsored by federal grants and receive less than 0.7% of need-based and less than 5.0% of non-need based aid awards nationwide.[50]

Though historically many states have had small merit-aid programs, funding problems in the late 70s and early 80s nearly extinguished them.[51] However, by 2001, 10 states (re)introduced serious merit based aid programs (AR, FL, GA, KY, LA, MI, MS, NV, NM, SC) and their political popularity make them an attractive alternative to broad-based state institutional appropriations. I include a dichotomous variable taking a value of one in the state-year where merit-based aid programs are prevalent (MERIT). The presence of merit aid would both reduce student demand for need-based aid and reduce a state's pool of available resources from which it might fund both need-based and institutional aid. I suspect the substitution effect will dominate the income effect in this case, though this is speculation that requires empirical confirmation.

Also included are the proportion of households with incomes below the maximum for which they would be eligible to receive a Pell grant (PELL) and an interaction between this term and the share of the population that is college-aged (PELLPOP). These are included to determine whether states make explicit attempts to capture additional revenues by allowing tuition to rise as more families become eligible for federal Pell grants.

Last, I include the enrollment weighted average nonresident tuition at four-year public institutions in the geographical region that the state is located in, excluding schools in that state (REGTUIT). When

[49] Whether I should include the share of enrollments that are graduate students in any equation is debatable. Graduate students are more expensive and therefore might cause the share allocated to higher education to lag. However, their impact also depends whether *a priori* they are more likely to remain in states than undergraduates. In addition, the research that is produced by graduate students and their advisors may be viewed as more or less useful to the states than the general education of an undergraduate.

[50] National Association of State Student Grant and Aid Programs 32nd Annual Survey (2001), Table One.

[51] For example, the once substantial NYS Regents Scholarship Program ended in 1982 due to lack of available funds (Source: various NASSGAP Annual Surveys).

tuition at public institutions in neighboring states is higher, it allows public institutions in the state to increase tuition, increasing the demand for need-based aid by instate residents. Further, Rizzo and Ehrenberg (04) find that nonresident students tend to migrate more when the average tuition in their region is higher. Since state residents do not want to subsidize the children of non-taxpayers, it is likely that institutional support will lag under these conditions.

Other Empirical Specifications – Variables Added to Baseline Models

The baseline models above were determined through a heuristic process, guided by intuition and the goal of econometric stability. The latter implies that the included variables in each equation were largely invariant to different econometric specifications and variable definitions. For efficiency reasons, it was necessary to keep these baseline specifications are simple as possible. However, I also estimated equations that included additional variables. These variables were excluded from the baseline specifications because of suspected endogeneity, extreme multicollinearity or due to objections over whether they belonged in the models at all. The following is not intended to read like a laundry list, but rather is indicative of the large number of factors that affect state funding for education.

Were one to peruse the relevant literature, it would be apparent that the most glaring omission from the baseline specifications are explicit measures of enrollments. Enrollments in both public K12 and higher education institutions are very likely a function of government revenues and expenditures themselves, and are also likely heavily correlated with many explanatory variables in the baseline models. Since there are no obvious exogenous instruments for enrollments, I address this issue in four ways.

First, the baseline regressions include variables that capture enrollment pressures, such as HEPRV and K12PRV as well as measures of the age distribution in the population. Second, I test whether treating explicit measures of enrollment as exogenous affect parameter estimates. I include the level of full-time equivalent public higher education enrollments (HE_ENROLL) and the level of public K12 enrollments (K12_ENROLL) in the EDSHARE equation; I include the ratio of these variables in the HESHARE equation and HE_ENROLL alone in the INSHARE equation. Third, I instrument for enrollments using public university tuition, measures of the age distribution in the population and the

education level of the population as exogenous variation.[52] Last, I include a measure of a state's higher education seating capacity to proxy for enrollment pressure – which is calculated as the ratio of a state's predicted enrollment in public higher education institutions to its actual enrollment in these institutions in a year (CAPAC).[53]

One might expect political factors to shift legislative preferences among different budget items. I estimate equations using a variety of combinations of the political variables. Liberal governments might be expected to spend more than conservative governments, or prefer one type of education service to another. I therefore include variables indicating whether the governor is a democrat (GOVDEM). To determine if political control of the statehouse affects funding priorities, included is a dummy variable taking a value of one if both the assembly and the senate are controlled by a single political party (UNIPARTY). I also include a dummy variable to control for governor election years (GOVELECT) because research has found that political business cycles are marked by increased spending and other reflationary policies in periods immediately before and after an election (Nordhaus '75) and that tax hikes and spending cuts are smaller in these years (Poterba '94).

There may be political benefits associated with the provision of different types of education. According to this view, politicians use logrolling[54] to trade for forms of public education that benefit their

[52] It is not clear that these instruments are really exogenous. Since the IV estimates look identical to the non-instrumented regressions including enrollments treated as exogenous (with much higher standard errors) I will not report these results.

[53] Predicted enrollments are calculated by dividing a state's full-time equivalent public enrollments in 1970 by the size of the college-age population in the state in 1970 (ages 18-24) and then multiplying this ratio by a weighted cohort size in each year of the study. If both the share of students going to publics and college enrollment rates in a state remained constant over time, then the weight used to calculate predicted enrollments in year t would simply be the size of the college age population in year t. Between 1970-2000, the share of students attending publics was stable (between 75-80%), but enrollment rates increased nationwide from 28.8% to 42%. To account for the enrollment rate expansion, I allow the population weight to grow as the enrollment rate grows in each year. I would prefer to have used the ratio of seats available in public colleges to the number of its high school graduates as a capacity measure, but did not do so because of endogeneity concerns.

[54] Paul Johnson provides a useful definition of the process on his web page at http://www.auburn.edu/~johnspm/gloss/index.html?http://www.auburn.edu/~johnspm/gloss/logrolling.html. He describes it as "a practice common in the U.S. Congress and in many other legislative assemblies in which two (or more) legislators agree for each to trade his vote on one bill he cares little about in exchange for the other's vote on a bill that is personally much more important to him. Logrolling is especially common when the legislators are relatively free of control by their national party leaders and are trying to secure votes for bills that will concentrate sizable benefits on their own home districts while spreading most of the costs out over taxpayers in the rest of the

constituencies. For example, logrolling may have led to the creation of a large number of new two year colleges in a sufficiently large number of legislative districts in California so as to make the entire education package politically viable. Since most state assemblypersons have a K12 school system and/or a community college in their district, they might be expected to support programs in the legislature that directly benefit their district. Many state senate districts include multiple K12 school systems and likely include regional public colleges and universities. Thus, state senators might be expected to support more broad based educational and other initiatives. To control for these factors, I include a measure of the number of assembly seats per the number of senate seats in a state (LEGSEAT).

Finally, I include the percentage of the voting age population that cast votes in congressional elections (VOTE). High levels of voter interest force legislators to more accurately represent their preferences. In addition, voters may favor more or less spending on K12 and higher education because the funding schemes for these budget items are largely more transparent than that for other state budget items. The a priori impact of an active populace is unclear however.[55]

Goldin and Katz ('99) discuss the importance of a state's industrial composition on the structure of its higher education system. To control for these impacts, I include measures of the share of gross state products generated by broad industrial categories (GSP*).[56] For example, states with significant mining industries have historically benefited from the research and extension services produced by public land-grant institutions in their state. On the other hand, states with a majority of their productivity generated from financial services may not depend on universities for anything more than producing pools of talented individuals to fill its employment ranks – which need not come from in-state. More highly developed states are also assumed to require increased levels of societal interdependence, greater need for

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country. Local projects such as Federally funded dams, bridges, highways, housing projects, VA hospitals, job-training centers, military bases and the like are often pushed through by logrolling." Some papers infer that a positive impact of two year enrollments on higher education funding as evidence of logrolling.

[55] I'd like to analyze models of bureaucratic behavior by including the number of government employees in each budget category (i.e. bureaucrats) in the regressions. These self-interested bureaucrats are likely to push government spending beyond the level represented by median voter preferences and may also push spending disproportionately to areas where their numbers are strongest. However, government employment is also a function of expenditures and the data I was able to find were not sufficient to address this issue.

[56] (1) Agriculture, Forest, Fisheries and Mining; (2) Construction, Manufacturing, Transportation and Utilities; (3) Finance, Insurance, Real Estate and Service; (4) Government Spending; (5) Retail and Wholesale Trade.

police protection, and externalities requiring governmental regulation and intervention that may draw resources away from education (Garland '88).

To control for the structure of the tax system in each state, I include measures of the share of state general fund tax revenues generated by different sources (TAX*).[57] Some taxes are more transparent to voters than others and these measures may partially pick up the effects of fiscal illusion.[58] These measures may also capture a state's ability to raise additional revenues during difficult financial times.

Among the other variables tested in the models are the education level of the population (EDLEVEL), the quality of high school students in a state as measured by average SAT scores (SAT), college enrollment rates (ENRATE), and variables specific to the higher education system in the state. These higher education variables are included because outcomes are notoriously difficult to measure (and likely endogenous) and state government funding for public higher education may well depend on the following: total expenditures on research and development at public institutions per capita (RND), total annual giving per student at the publics in the state (GIVE), total market value of endowment per student at publics in the state (ENDOW), the mix of PhD degrees awarded relative to undergraduate degrees (PHDBA) and the share PhDs awarded in sciences (SCIPHD).

Other Empirical Specifications – Splitting the Sample

The regression estimates from above produce average state responses to changes in the various included variables. However, since there are important institutional and demographic differences across states (most if which are time invariant), I will test for the presence of identifiable differences in short-run state budgetary dynamics that are related to these institutions by splitting my estimation sample along a number of dimensions. In other words, while institutional characteristics may explain differences in budget outcomes across states, they also suggest that educational funding in a state like New York, for example, may respond differently to a widening income distribution than a state like Iowa.

[57] These sources include individual income taxes, corporate income taxes, motor fuels taxes, license taxes, lottery revenues, general sales taxes, and other taxes.
[58] Voters-taxpayers may not be fully aware of the true composition of government expenditures because all types of taxes and expenditures are not equally visible.

Splitting the sample is preferred to including explicit controls for institutional characteristics for four reasons. First, doing so will increase the homogeneity of each estimated sample. Second, including explicit controls that do not vary over time will wash away in panel estimation as all of the variation in fixed-effects regressions are identified off of within state changes. Third, including explicit controls, even if they vary over time and are estimable, constrains parameter estimates of the other explanatory variables to be the same across different states. I want to be able to test whether different states react differently to changes in the other explanatory variables. Fourth, it is very likely that the fiscal institutions represented by these variables are themselves endogenous. For example, states with funding formulae for higher education may have also been the states with historically low levels of higher education funding – spurring the need for a formula. Again, to highlight just how difficult estimating legislative demand is, I cut the sample according to nine different structures.

Funding formulae were instituted (in 29 states) to assist states in setting higher education appropriations levels and to ensure institutional funding continuity by linking state funding to enrollments based on pre-defined ratios and expenditure rates.[59] One might expect EDSHARE and HESHARE to be more affected by variables reflecting enrollment pressures in funding formula states than in non-funding formula states. Further, one may also expect the impact of income, other demographics and competing interest groups to be lessened in these states. Leslie and Ramey ('86) found that the relationship between funding levels and enrollments was stronger in the formula states while Toutkoushian and Hollis ('98) found just the opposite.

Lowry ('01) points out that most studies on higher education do not account for the ability of public universities to lobby the legislature. States where there are fewer governing boards should be able to coordinate lobbying efforts more effectively and prevent the lobbying of one institution to cannibalize support for another. Therefore, one would expect to find a larger HESHARE in these states than in those

[59] MGT of America. www.mgtofamerica.com . This does not mean that states with funding formulae have predictable funding levels. Quite the contrary occurs. The determination of the funding formulae themselves have become part of the political process, as opposed to determination of funding levels directly. In addition, these funding formulae themselves are not binding as actual appropriations can vary from the prescribed amounts.

with less coordinated governance, ceteris parabis. For example, CA has 2 governing boards and a 17% HESHARE while MI has 13 governing boards and a 12% HESHARE. Based on Lowry's estimates, I split the sample classifying half the states as having "relatively autonomous" institutions and the remaining half as having "relatively non-autonomous" institutions. Institutional autonomy comes at the expense of state support and one would expect that the link between demographic and economic factors and budget shares to be weaker in these states.

The structure of state budget processes also likely affects how budget shares are determined. Currently 23 states operate on a biennial budget cycle and 37 states have granted their governors powers to reduce appropriations levels without legislative approval.[60] The latter may prevent pork-barrel spending or political logrolling while the former might limit the year-to-year variations in the budget shares that might otherwise be observed as demographic or economic conditions change.

I also split the sample based on political institutions. It might be the case that in states where there is less political competition, historical factors play a larger role, or that higher income individuals and competing interest groups have influence in the political process. In more competitive states, budget outcomes are likely determined by representatives taking measures to insure their reelection – we would therefore expect the impact of median voter type variables to be larger in these states. As a result, I split my sample in half based on a political competition index created by Holbrook and Van Dunk (93).[61] One might also expect that fiscal behavior is different when the state executive and legislative branches are controlled by a single party. Multiparty governments are unlikely to reach a consensus on many issues. Further, when the government is multiparty, both the governor and legislature are politically vulnerable and may be unwilling to take unpopular actions, such as raising taxes or cutting spending and would therefore be more responsive to the demands of the median voter. Single party governments may be able

[60] National Association of State Budget Officers, *Budget Processes of the States*.
[61] They calculate an index for each state where 100 represents perfect competition and 0 represents no competition. The average is 38.2 with states in the Southeast generally near the bottom and states in the Midwest and Northwest near the top.

to pursue agendas independent of voter desires, or have budget outcomes influenced by interest groups that help them remain in power.

Last, I split the sample according to demographic structures. Estimating equations according to population density allows me to capture the scope and dispersion of a state's economic activities as well as to increase the homogeneity in the demands for particular public services within each sample. High density states are much more homogeneous in character than the low density states and one would expect the impact of competing interests to dominate in states with more dense populations. I also split the sample according to the time periods representing inflection points in education funding from figure 4, that closely match the timing of the previous decades' recessions. It will be interesting to determine if education funding behavior has significantly changed after each of the earlier recessions – which may provide us with some insight into how states might respond to the current and future economic difficulties. Regressions are also run separately for states in the South and the Northeast to better control for historical economic and private market factors.

IV. Data

The analysis in this paper involves a broad panel data set which was assembled from over 30 different sources. Appendix Table 1 provides a brief description of how each variable was calculated and the sources from which they originated.[62] The large number of variables, permutations thereof, and assumptions used in creating them would merit a volume unto itself. Therefore, I will limit this discussion to some general comments about the data set and the outcome variables I am interested in explaining.[63]

Table 1 reports summary statistics for six categories of variables used in the analysis. The income and budget measures and the demographic characteristics are derived largely from U.S. Census sources, while the enrollment pressure, competing interests, political, and higher education specific

[62] Unfortunately, there does not exist a comprehensive "state data book" for all of the information I was interested in collecting. Since much of the data was collected manually, there no doubt exists measurement error in many of the variables, though any errors are likely to be unsystematic.

[63] A more comprehensive description of the data can be found in my dissertation and will be accessible on my website at http://www.people.cornell.edu/pages/mjr38.

characteristics are derived from less prominent sources. The table presents data for three representative years (1977, 1989 and 2001) to highlight how each of the explanatory variables has changed over time. All year references represent fiscal years ending on June 30 of the corresponding year while all dollar values used in the analysis herein represent constant 1998 dollars.

Table 2a displays the level of general fund budget expenditures, education budget expenditures and higher education budget expenditures for 4 representative states and the national average, and is useful for assessing the magnitude of the impacts of regression estimates presented in the next section. These data indicate that even very small percentage changes in budget shares translate into very large dollar amounts. For instance, a one percentage point increase in the HESHARE in an average state would result in an additional $75 million for higher education, and as much as a quarter-billion additional dollars in New York.

The choice of the general fund as my unit of analysis was made with great care. A state receives revenues from a variety of sources including federal government appropriations, bond sales, broad based taxes and earmarked programs. Though average general fund expenditures account for slightly less than 50% of total state expenditures, what happens in the state general fund is the best single gauge of the financial position and commitment of a state.[64] This is because the general fund does not include any special funds restricted by law for specific government activities or functions, nor does it include monies used to fund ongoing capital projects or from other branches of governments. Therefore, the general fund is the portion of state budgets that legislatures and governors have the most appropriative power over in order to fund the ongoing operations of the various state budget items.

Though the Census Government Finance data files report separately budgeted expenditures on higher education, the information I use to construct the HESHARE and INSHARE variables is obtained from the Center for the Study of Education Policy at Illinois State University (called Grapevine). Grapevine makes great efforts to capture the most discretionary portion of state higher education budgets. The data do not include appropriations for capital outlays and debt service, no appropriations from monies

[64] NASBO State Expenditure Report, 2001 p.2.

derived from federal sources, student tuition or fees, auxiliary enterprises and other non-tax sources. For example, all tuition revenues in Texas are collected by the state and redistributed to the schools in the Texas system. These expenditures are included in the Census finance files, but not in the Grapevine data.[65] From this data, I subtract the total amount allocated to private colleges and universities, as reported by the NCES' Integrated Postsecondary Education Data System.

V. Results

This section presents empirical findings that explain why public education, and public higher education in particular, seems to be a diminishing state priority. The estimates should be viewed as reduced form approximations to the underlying demand models discussed in section III. Using state level data for 26 years between 1972 and 2001, the first sub-section presents baseline regression results. The second sub-section presents estimates of a model that reconsiders the context in which budgetary decisions are made by estimating the extent to which states practice incremental budgeting. The third sub-section discusses a number of simple extensions while the fourth summarizes statistical and interpretive challenges.

To understand why budget shares *change within a state* over time, I take full advantage of the panel nature of the data and present estimates that include both year and state effects. Inclusion of state effects controls for unobservable state-specific factors that are constant over time. These factors might include: climate, presence of national parks, high levels of average wages, historical factors, etc. – each presumed to vary across states, but to have a constant impact over time within states.

The within estimator answers questions like, "holding all other factors constant, what is the expected change in the HESHARE within a state if some observable factor increases by one unit?"[66] If

[65] One might argue that tuition redistribution is up to the discretion of state legislatures as well, but I want to capture the allocation of tax dollars to higher education. Nonetheless, regression estimates that use only census data to compute budget shares are very similar to estimates using the Grapevine data and their presentation is therefore suppressed.

[66] The within estimator (often referred to as a "fixed effect" estimator) is a convenient choice to control for state specific omitted variables because it allows for arbitrary correlation between the unobserved state effect and observed explanatory variables that other estimation strategies do not permit (it is very likely in this setting that unobserved fixed factors that affect budget shares also are correlated with observed time varying factors. For

the state effects were excluded from these regressions, the answer may be misleading if the excluded state effects were correlated with explanatory variables in the model. For example, states with no parkland will have more resources available to devote to higher education. However, if the level of out-migration is negatively correlated with the number of state parks, then the estimated effect of out-migration on the HESHARE would not only pick up the investment decision that states face, but also the impact of a state park system on higher education budgets.

Year effects are included in the models to control for unobserved, time-specific factors that are constant across all states. These factors include: changes in federal laws, federal court decisions, international conflicts and trade patterns, changes in the value of the Pell grant, changes in technology and the education production function, etc. – each presumed to change over time, but to impact all states in the same way.[67] Inclusion of time effects also removes the impacts of systematic changes in the explanatory variables so that the results presented below reflect within-state responses to idiosyncratic shocks alone. For example, when systematic changes in enrollment pressures are controlled for, one might expect to observe smaller changes in budget shares when there are idiosyncratic shocks to

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instance, the year of statehood is very highly correlated with the percentage of college students enrolled in private schools). Though other strategies may be more efficient (which would be important in such a small data set such as the one I employ), the within estimator is still consistent. The unobservable effects are treated as parameters to be estimated in this model, which is useful to analyze state preferences for particular budget items. Further, the within estimator is useful for making predictions about how states will respond to changing demographic, economic or political conditions within a state.

[67] Since the explanation of cross-sectional differences in state budgeting for higher education or K12 education are largely understood (historical factors, private influences, industrial composition in the state, demographic structure, etc.), I present these results in my dissertation for comparative purposes. The distinction between the within estimator presented in this section and the between estimators is worthy of more attention, and is largely ignored in the related empirical literature. In most cases, it would be a large coincidence to observe the same difference in budget share outcomes from observation of two different states with a one unit difference in an explanatory variable between them versus observation of a single state that experiences a one unit increase in that same explanatory variable. While it might be true that some variables act like this, there is no theoretical reason why all of them should. For example, if I observe two different states, one with a court-reformed K12 finance system and the other without, I might expect the HESHARE to be larger in the reform state because this state likely had lower state support for K12 education, resulting in the court decision. On the other hand, if I observe a single state before and after the reform decision, I expect the HESHARE to be smaller, because this is implicitly what the court mandates.

enrollment pressure, due to competitive tax pressures, institutional capacity and other factors unique to a given state.[68]

Econometric Estimates – Within State Findings

Table 3 presents OLS regression estimates for the education share (EDSHARE) and higher education share (HESHARE) equations while table 4 presents OLS estimates for the institutional share (INSHARE) equation. The dependent variables are each defined in percentage point terms, so that an estimated coefficient of 2.5, for instance, indicates that an increase in an independent variable of 1 unit results in an increase in the relevant share by 2.5 percentage points.[69] All of the results discussed below are *ceteris parabis*, holding all other factors constant.[70]

The results in column (i) of table 3 suggest that changes in the distribution of income and age composition within a state are responsible for changes in the EDSHARE depicted in figure 2. Each $1,000 increase in real household income (INC) results in a 1.3 percentage point loss in education's share of the overall budget. This relationship is nonlinear however and reaches a minimum at $58,000, just beyond the distribution of income observed in 2001 (Maryland = $53,000). The results also suggest that the increasing inequality of income (INEQU) has resulted in a fall in preferences for public education.

[68] For example, impacts of K12 enrollment changes on HESHARE changes would be net of any national trends in K12 enrollments. It is agreed that rising K12 enrollments were a key factor in the growth of state and local spending in the late 50s and 60s as well as in the 90s. Allowing for year effects removes such systematic changes in the size of the school-age population from affecting the results in this analysis.

[69] Models were also estimated using a variety of definitions for most of the independent variables and produced qualitatively similar results. For example, in models where the age distribution is entered continuously, I find that the EDSHARE decreases as the median age of the state increases, ceteris parabis. These and other models are included in an appendix to my dissertation.

[70] Though some state level variables do not exhibit great variation year over year, over the entire 30 year period of the sample there is considerable variation. Regression results using 3 year moving averages, or 5 year intervals of data are qualitatively similar to the results reported below. Further, a cursory analysis of the outcome data indicates that the largest changes have occurred for the HESHARES. If one were to rank the states according to the budget share measures, one would observe that the rank order correlation on each outcome is not constant over time for the HESHARE, and is much more constant for the EDSHARE and INSHARE. For example, the correlation of state rankings on EDSHARE between 1977 and 2001 is 0.67 while the correlation of state rankings on HESHARE is 0.36 – indicating that changes at the macro-economic level are not solely responsible for changes in the HESHARE, but rather state specific factors are important.

Together, these estimates suggest that changes in the distribution of income have accounted for over 100% of the observed changes in the EDSHARE since 1972.[71]

The changing age composition within a state produced expected changes in the EDSHARE. Changes in the fraction of the population that is school-aged (SCHOOLAGE) were positively correlated with the EDSHARE while an increase in the share of the population that is elderly (ELDERLY) caused a fall in the EDSHARE. Prior research by Poterba (1997), Case et al (1993) and Borge and Rattso (1995) all find a negative correlation between student cohort size and per pupil education funding levels. Though I find a strong positive effect of student-cohort size on budget shares, one cannot infer how expenditures per student will fare. While the point estimate on the elderly share does not appear large, it implies that by the year 2025, when the elderly share is expected to increase by an average of 5 percentage points, that education will lose an additional 2 percentage points in state budgetary priority – representing nearly a half-billion dollars in an "average" state (2001 dollars).[72]

An important finding is that in state-years after a court rules that a state's K12 education finance system is unconstitutional (COURT), the share of the general fund budget allocated to education increases by 1.2 percentage points.[73] This result is consistent with Murray et al's (1998) finding that court reforms in 16 states led to an average increase in per capita K12 spending of 23%.

Turning to the HESHARE results in column (ii), I find that in addition to the factors that affect EDSHARES in column (i), changes in demographic heterogeneity, migration patterns and economic conditions help explain why public higher education has been crowded out by K12 education. While changes in the income distribution have worked in HESHARE's favor, the effects are offset by the losses suffered through education's declining priority in the overall budget process. Increases in household income of $1,000 (INC) result in increases in HESHARE by 0.6 points throughout the entire range of

[71] Real income increased by approximately $6,000 over the entire period, the ratio of income of the 75th percentile to the 25th percentile increased by 0.2 points since 1977.
[72] http://www.census.gov/population/projections/nation/summary/np-t3-f.pdf. This may also partially be picking up the impacts of the increasing Medicaid burden within states, as the elderly make up a large fraction of beneficiaries.
[73] I plan to test different variations of this variable to see whether the timing of the decisions was anticipated by states and for how long after a court decision did the impact on budget shares begin, and persist. Further, this finding is invariant to a multitude of econometric specifications.

observed income (the maximum is reached at $79,000).[74] The estimates also suggest that an increase of income inequality within a state (INEQU) results in a larger share of the available education dollars being allocated to higher education. This result, while a positive one for higher education, may not be in the best interests of society at large. Previous research by Hansen and Weisbrod (1969), Windham (1970), UNESCO (2003), suggest that the economic middle and upper class have been able to shift income toward itself in the political process using the higher education finance system, and that in places where inequality is severe, investments in higher education will exacerbate the existing income differentials.[75]

Age demographic shifts have also worked in higher education's favor. While states are favorably responsive to changes in the relative size of the college aged cohort to the K12 aged cohort (COLRATIO), there is also modest evidence that aging populations (ELDERLY) look more favorable on higher education than K12 education. This result may reflect a lower perceived relative tax price for higher education by the elderly or a more immediate public benefit perceived to be available through financing university research.[76]

Taken together, income distribution and age demographic shifts indicate that higher education's share of the education budget should have gone up by nearly 5 percentage points since 1977. Since the HESHARE fell by approximately 6 points, other factors must account for an 11 percentage point fall.

There are two estimates that will help predict why higher education may face difficulties in the future, but are not able to explain the observed changes in the past – out-migration and unemployment. While the estimated coefficient on the out-migration of the college-aged population (OUTMIG) suggests that increases in out-migration lead states to devote fewer resources to higher education, over this time

[74] To highlight, an increase in median income in an average state of $1,000 would result in higher education reaping 17% of the education budget as opposed to 16.4%. However each $1,000 increase in median income also results in a decline in the EDSHARE to 34.9% from 36.1% in 2001. Therefore, higher education's share of the overall budget remains roughly constant at 5.9%.

[75] However, Lee, Ram and Smith (1999), Cardak (1999), Hight and Pollock (1973) and Biggs and Dutta (1999) present evidence that the system of higher education finance can also be useful to redistribute income toward the economically less advantaged.

[76] A majority of elderly wealth is concentrated in home equity, from which property taxes are assessed to finance local schools. Further, since income levels are smaller – they pay less (or no) income taxes and are often granted discounts on state sales taxes which might be used to finance higher education appropriations.

period the average level of out-migration across states has remained fairly constant.[77] Similarly, I find that as the unemployment rate (UNEMP) increases by one percentage point, states respond by cutting the HESHARE by .22 points; however, the average unemployment rate over this time period fell by 2 ½ percentage points.

The estimates in column (ii) suggest a trend that demographic heterogeneity can have a very important effect on education spending. I have included two variables in this equation to capture these impacts. First, I include a variable for the ratio of the college-aged population that is non-white relative to the K12-age population that is non-white (COLK12RACE). To see whether the impact of this heterogeneity varies according to the racial make-up of the non-school age population in the state, I also interact it with the share of the population aged 25 and older than is nonwhite (RACEINTERACT). While not statistically significant, an interesting result is that as the college-aged population becomes more nonwhite relative to the K12 population, states devote more resources to the population that is "whiter." However, the impact of this heterogeneity becomes statistically significant and larger when the non-school age adult population is more homogeneous.[78]

K12 court reforms have had a large impact on the HESHARE. The estimates suggest that as a state moves to more centralized methods of K12 financing (COURT), the average impact over time has been to decrease the share of the education budget allocated to public higher education by 1.2 points. In an average state in 2001, this represents $90 million more that public higher education would have been allocated in the absence of the reform program. This result somewhat contradicts the work of Murray et al (1998). While they conclude that the increased expenditures on K12 education did not come at the expense of any other budget item, their study concluded in 1994. Taken together with the EDSHARE

[77] Though, wages and other factor prices may fall when out migration increases, so lower higher education expenditures may not necessarily indicate that lower levels of service are being provided in the face of out-migration patterns.

[78] In other words (ignoring the fact that I am estimating changes for a moment), higher education funding falls more in states with more heterogeneous racial compositions across different school age cohorts. The more white the non-school age population gets, the more precipitous this fall will be. Only a couple of researchers have looked into this variable. Poterba (97) finds that different racial mix affects funding for K12 education at the state level while Ladd and Murray (2001) do not find evidence at the local level.

result, I find that public higher education spending has been partially crowded out by the increased K12 expenditures resulting from the K12 court reforms.[79]

The estimated effects of the independent variables on INSHARES in the left hand column (i) of Table 4 can be described briefly. The relationship between demographic changes and the share of higher education budgets appropriated directly to institutions is strong. Increases in the share of the population that is college-aged (COLLAGE) result in higher INSHARES, so that the subsidy is received by a larger pool of people than would otherwise be the case. However, the size of the college aged cohort has fallen markedly since 1972, resulting in a one point loss in the INSHARE. Aging populations tend to support institutions rather than students as well. The Pell grant variables yield interesting results. As more households become eligible for federal Pell grant awards (PELL), it appears that states respond by reducing the share of aid awarded to institutions, and that this effect is larger when the share of the population that is college-aged (PELLPOP) is larger, though the overall magnitude is minimal.

As with the HESHARE, ethnic heterogeneity across age cohorts has an important impact on the INSHARE, with the share going to institutions falling when the college-aged population becomes more nonwhite relative to the adult non-college-aged population (COLRACERATIO).[80] Whether this decline is due to an effort to direct merit aid away from nonwhites, or because nonwhites have a larger demand for state need-based aid cannot be immediately discerned from this result. I return to this important issue in a moment below with a "psuedo-natural experiment" treatment.

Looking to the bottom panel of the table, the estimates suggest that movement to a merit aid program (MERIT) reduces the INSHARE by nearly 3 percentage points. Also, as the nonresident tuition rates at public four year institutions in the geographic region (REGTUIT) increase, states are increasingly

[79] The total loss is near $60 million according to 2001 figures for the average state. In the absence of the reforms, higher education in an average state received 16.4% of the education budget which received 36.1% of the overall budget, or about 5.9% of the overall budget. After the reform, higher education receives only 15.2% of the education budget, which received 37.2% of the overall budget, or about 5.6%. The general fund budget in an average state in 2001 was approximately $20 billion.

[80] In results not reported in Table 2, it appears as though the effect of the racial heterogeneity is felt most acutely by states that are aging fastest. When an interaction between the share of the population aged 65 with the ethnic heterogeneity variable is included in this model, the first order impact of the ethnic heterogeneity disappears, but I find that the elderly support for institutions falls as the college aged population becomes more nonwhite.

turning to student aid rather than institutional appropriations – explaining approximately one percentage point in the INSHARE drop. Again, the reasons for doing so are unclear. It may be the case that higher regional tuitions permit instate publics to charge higher tuitions as well, reducing the pressure on direct state support, or reduce the demand for own residents leaving the state. It may also be the case that higher regional tuition signals an improvement in school quality, and in an effort to compete with these institutions, the state induces its resident students to stay by providing them with larger student aid packages.

Column (ii) presents regression estimates that try to explain the motivation for the increasing popularity of state student merit aid programs. Taking liberty with nomenclature and variable interpretation, I accomplish this by including four additional variables to the specification in column (i): second order interaction terms between the merit aid variable (MERIT) and the median income level (INC); MERIT and the relative nonwhite college age population (COLRACERATIO); INC and COLRACERATIO; and finally, a fully-interacted variable of MERIT x COLRACERATIO x INC.[81] This fully interacted model is akin to a natural experiment approach that answers the question, "Do merit aid states that have heavily nonwhite college populations favor broad based institutional aid or more targeted student based aid?" The results are disheartening. While the impacts of the variables in the baseline specification are largely unchanged by the inclusion of the interacted variables, the first-order impact of moving to merit aid programs grows dramatically to nearly 7 percentage points. The variable of interest, MERIT x COLRACERATIO x INC, which can be viewed as a continuous analog to a "difference-in-difference-in-differences" estimator, yields a statistically significant negative result. Considered liberally,

[81] For the sake of brevity, I do not present the estimates from intermediate regressions that introduced the second order interactions independently. In each of these regressions, the second-order interactions were each statistically significant and of the expected sign. MERIT x COLRACERATIO yielded positive and statistically significant results – indicating that states that move to merit aid tend to favor student aid less when the college aged population is increasingly nonwhite – providing support for the notion that the rising importance of merit aid programs has been largely a political scheme to attract middle and upper class white votes and dollars. MERIT x INC yields statistically significant negative results – which can be interpreted as when income increases in the merit aid states, support for student aid is more dramatic than when income increases in the non-merit aid states. INCx COLRACERATIO yields a statistically significant negative result – indicating that when income increases in states with relatively more nonwhite college age population, broad based institutional support falls more than when a state is less nonwhite in its college age population.

this implies that while merit aid states with large nonwhite college aged populations favor institutional support, these states only do so when income is low. When income is high in these states, student aid is preferred – with the somber implication that the increasing popularity of merit aid programs has not been altruistically motivated. Targeted, non-means tested programs seem to be used to redistribute income to middle- and upper-income families and to avoid providing broad-based support to economically disadvantaged members of the populace.

Econometric Estimates – Incremental Budgeting

The results presented in tables 3 and 4 have implicitly assumed that legislators receive utility from every single dollar budgeted for a specific agency. In other words, the baseline specifications allow the entire budget share to be a decision variable. The inability of the explanatory variables in these models to explain all of the declines in the observed budget shares signals that this may not be the case in practice.

It has been suggested that states make funding decisions on an incremental basis, with previous budget levels taken as given when determining current budget allocations.[82] Consider the HESHARE equation as an example. The interpretation is that for any level of budgeted funds for education, the legislators first make expenditures for the minimum level of services required to be provided by K12 and higher education. Then with the remaining budgeted funds, they choose the increments to these budget levels so as to maximize the branch utility function (branch III in figure 5), which depends only on the increments to the minimum expenditures, not on the absolute levels.

The empirical implications of this behavior are that rather than estimating an equation for the HESHARE that resembles:

$$HESHARE_{it} = a + \beta X_{it} + c_i + e_{it} \ , \qquad (4)$$

I would need to estimate an equation that resembles:

[82] It has also been put forth that budgetary decisions may transition away from incremental budgeting in scarce times due to the increased competition for resources when resources are limited. In these cases, other practices may be adopted. (The Profession of Budgeting. *Public Budgeting and Finance* v10, n2 (Summer 1990): 102-06 Standard No: ISSN: 0275-1100.)

$$HESHARE_{it} - \gamma HESHARE_{it-1} = a + \beta X_{it} + c_i + e_{it} \ , \qquad (5)$$

If (5) is the correct model, then shifting the lagged dependent variable to the right hand side and estimating within state changes will lead to a correlation between the error term and the lagged dependent variable, even if the error terms themselves are not auto-correlated. This violation of the orthogonality assumption will not only result in biased estimates of γ, but will likely introduce bias in many of the other parameter estimates in the model.

Fortunately, techniques have recently been developed that allow for a satisfactory treatment of this complication.[83] The even numbered columns of Table 5 present estimates of the baseline equations using the Arellano-Bond dynamic panel estimation technique. While there is some efficiency loss due to the necessity of using lagged dependent variables as instruments, as long as the error terms are well behaved, the results will be consistent.[84] For completeness, I present the results of uninstrumented models in the odd numbered columns. State budgeting would be strictly incremental if the estimated effects of the lagged dependent variables were each equal to one. If the coefficients equal zero, then it is the case that the entire budget is determined "from scratch" each budget cycle. Therefore, values of γ between 0 and 1 provide for the possibility that expenditures within any budget category can be cut to some extent during that budget cycle.

It is not surprising the that estimates in Table 5 indicate that budget shares are determined in part by an incremental process, and in part by a discretionary process. Looking to the EDSHARE results in column (ii), including the lagged EDSHARE diminishes the importance of the income distribution and court reform variables, while removing the influence of demographic changes on changes in education

[83] To be consistent with the estimates in Tables 3 and 4, I want to preserve my "fixed effects assumption" that the unobserved state specific effects are correlated with the observed explanatory variables. Until recently, dynamic panel estimation techniques were unable to accommodate this assumption. They required an explicit specification of the distribution of c_i, and also required that its conditional expectation (on X) to be zero. Instrumental variables generalized methods of moments techniques have recently been developed that take first differences of equation (5) and use lagged differences or lagged levels of the dependent variables as instruments for the endogenous lagged dependent variable. See Greene (pp. 582-584) and Wooldridge (pp. 412 and 493-495) for more detailed discussions.

[84] One key assumption is that there is no second order auto-correlation in the first differenced idiosyncratic errors. If errors are auto-correlated, even if only first-order, specification (5) is subject to bias as both $HE_{i,t-1}$ and $e_{i,t-1}$ appear on the right hand side of the equation.

budget shares. The coefficient on the lagged variable (LAG) indicates that in each period, 73% of the EDSHARE budget is preserved, with the remaining 27% left to legislative discretion.

Including the lagged dependent variables in the HESHARE equation (column iv) has a similar impact on its baseline estimates. Compared to the results in Table 3, column (ii), the impacts of the changing income distribution are removed and the magnitude of the court rulings on budget share changes is smaller. However, the ethnic heterogeneity result is robust to this specification change. As one might expect, it appears that legislatures exercise more discretion over the higher education budget share determination than they do to the process one branch above, with only 56% of the HESHARE determined by the level of HESHARE one period earlier.

Moving to the INSHARE equation in column (vi), it appears that legislatures exercise discretion over about ½ of this budget decision. Inclusion of this lag results in the loss of importance of the elderly demographic on INSHARES, but also causes many of the higher education specific variables to become important. In particular, I find that as the share of college students that attend two-year institutions (TWOYEAR) increases, and as the number of bachelors degrees awarded relative to graduate degrees (PHDBA) increases, states look more favorably upon institutional funding. This may reflect preferences for undergraduate education, or simply represent the fact that two-year colleges are less expensive to operate than four year colleges and that undergraduates are less expensive to educate than graduates.

To summarize, table 5 suggests that legislatures do in fact exercise a great deal of discretion over all three budget shares, with the least amount of discretion taken at the highest branch on the tree.[85] Further, treating the process as incremental as opposed to fully discretionary diminishes the impacts of some of the results in tables 2 and 3, but does not have a substantial qualitative impact on the interpretation of those results.

Econometric Estimates – Extensions

This section presents three simple extensions. First, I present results from augmented specifications of the baseline models. Second, I summarize relevant findings from estimation of the

[85] Statistical tests with the null hypothesis that the coefficient on each of the lags is equal to one are easily rejected.

baseline models on different sub-samples of the data. Third, since the previous estimates indicate that the falling HESHARE cannot be fully explained by changes in demographic, economic or income characteristics, I explore this issue in a bit more detail by considering the impact of tuition changes.

A) Augmented Specifications

Tables 6-8 present results that are similar to those in tables 3 and 4, but added to each baseline specification are groups of variables that capture political and voting characteristics (column 1), the sources of state general fund revenues (column 2), the composition of gross state product by industry (column 3), higher education specific variables (column 4 of tables 6 and 7) and other demographic characteristics (column 4 of table 6 and column 5 of tables 7 and 8). Since inclusion of any single group of variables had virtually no impact on the original baseline estimates, I have suppressed their presentation.[86]

The augmented EDSHARE regressions in Table 6 yield few notable results. The only important political variable is that as the state government moves from multiparty control to single party control (UNIPARTY), the education budget share increases.[87] States' increasing dependence on individual income taxes (REVINC) bodes well for education, though its impact is small. Each percentage point increase in the share of revenues generated from this source results in an EDSHARE increase of 0.07 points (the average share of revenues generated from individual income taxes increased by 4.6 points from 1977 to 2001). The results in column (3) suggest that the changing industrial composition within a state has had an important impact on education budget shares. Without exception, the results indicate that as the importance of all industry sectors increases relative to that of the sectors aside from Finance, Real Estate, Insurance and Services (GSPFIRE), education budgets expand. However, all of these sectors have

[86] I do not present models with all of the explanatory variables included due to the enormous multicollinearity in the data. Further, adding this many variables rapidly diminishes the degrees of freedom available in an already limited model.

[87] Estimates not reported indicate that this result is invariant to the specific party that is in control.

seen dramatic *decreases* in their contributions to state economies. The results indicate that the changing industrial composition has contributed to a 1.6 percentage point drop in the EDSHARE.[88]

Moving to table 7, the results in column (1) indicate that uniparty governments (UNIPARTY) prefer to fund K12 education, and this result does not depend on the specific party that is in control (not shown). The composition of political interests within state legislatures, represented by the number of assembly seats per senate seats (LEGSEAT), produces an interesting (albeit of small magnitude) result. The estimate indicates that as local representation becomes more prevalent in statehouses relative to representation of larger geographic areas, higher education does more poorly.[89]

The estimates in column (4) also merit discussion, though the higher education specific variables may have some degree of endogeneity built into them. Working up from the bottom of this column, there is not strong evidence that HESHARES have been falling in response to increases in seating capacity (CAPAC) in public higher education institutions. The positive coefficient on the share of PhD degrees awarded in science and engineering (PHDSCI) indicates that states look favorably on higher education when it produces highly skilled professionals in emerging science and technology fields. Legislatures are also more supportive of higher education when a larger share of students attend two-year colleges (TWOYEAR), presumably due to the low cost of these colleges and because their accessibility allows for the subsidy to be received by a larger pool of residents. This may also reflect political factors however, as community colleges are more numerous and reside in more political districts than their four year counterparts.

The most dramatic, and concerning, result in table 7 is the negative and significant coefficient estimate on real private giving per student at public research universities within a state (GIVE). As state

[88] The share of gross state product generated from FIRE grew by 13 points between 1978 and 2001. The magnitude of the estimate could be retrieved from a regression including only the share of GSP from FIRE, and omitting all other GSP variables. I do not include this variable in the baseline results due to its high correlation with the median income variable and the share of schooling that occurs in the private sector. Therefore, it is difficult to assess what this variable represents.

[89] While one might expect this variable to only vary in the cross-section, only 13 states did not change the number of assembly seats between 1972 and 2001 and only 10 experienced no changes in the number of assemblypersons per senator. Aside from capturing the impacts of self-interested assemblypersons, this variable may also reflect demographic factors, as changes in legislative representation and even in district lines are a function of changing population sizes and ethnic heterogeneity.

funding continues to lag behind, public universities have increasingly looked to private donations to supplement their revenue streams. However, some observers have worried that states would view these revenues as replacements for future state appropriations, and allow institutional appropriations to lag in the future. Their fears are well founded. Despite the seemingly small point estimate (each additional $1,000 per student raised resulting in a 0.36 point loss in the HESHARE), the magnitude of this crowding out cannot be ignored, especially in the most recent decade. For example, public research universities in Maine have increased their annual private giving per student by $5,800 since 1990. The coefficient estimate indicates that their HESHARE should have dropped by 2.1 points as a result – which explains nearly all of Maine's 2.3 point drop over this period. In fact, for each of the five states that have seen their public universities increase per-student giving by over $3,000, the average fall in HESHARES has been 6.4 points while the five states that have not increased private fundraising efforts since 1990 have seen their shares fall by only 3.9 points.[90] This result also casts doubt on the ability of public universities to generate rainy-day funds or to stockpile appropriations in lush times (as their private counterparts can do), due to a fear that future appropriations would be smaller in response.

Turning to the INSHARE results in table 8, the estimates indicate that political factors (column 1) are contributing to the decline in institutions' share of higher education budgets. The estimates indicate that as a state's voters become more active (VOTE), and that as a state moves from a Republican governor to a Democratic governor (GOVDEM), student aid increases in attractiveness relative to institutional appropriations though the magnitude of these effects is small.[91]

While the estimates of the industrial mix variables (column 3) and other demographic variables (column 5) yield no significant results, the variables representing a state's revenue sources (column 2) and higher education specific characteristics (column 4) do. The estimates in column 2 suggest that as states

[90] I plan to examine this issue in greater detail in the future. There is an obvious concern about timing and/or endogeneity. With regard to timing, I estimated equations using a 1 period lag of giving and find even stronger results – with the coefficient rising to –0.420 (0.104). I plan to re-estimate this equation with an instrument for giving. See Ehrenberg and C. Smith (2001) for a description of the factors that should be included.

[91] These results hold when the equation is re-estimated excluding Georgia (Democratic governor Zell Miller was the driving force behind the introduction of the large and politically popular HOPE merit scholarship program in 1993).

rely more on the individual income tax (REVINC), student aid programs grow in popularity. Since so many of the merit based aid programs are funded from lottery revenues, it is somewhat surprising that the share of a state's revenues coming from lottery sources (REVLOT) has no impact on INSHARES, though this may be due in part to its representing a small overall share of state general fund revenues.

Though there is a strong negative relationship between the share of PhDs awarded in the sciences (PHDSCI) and institutional aid shares, this may simply reflect the impacts of targeted student aid programs many years earlier. As with the HESHARE results in Table 7, institutional efforts to raise private monies (GIVE) seem to be met with retaliatory action by the states. The estimates in Table 8 indicate that every $1,000 increase in real private giving per student results in 0.23 points of the higher education budget leaving institutional coffers and going into the hands of the students.

Without any further discussion, it is worth citing the factors that do not seem to have an impact on any of the observed budget shares. These include: the education level of the population (EDCOL, EDHS), the level of public K12 and higher education enrollments (not shown), higher education seating capacity (CAPAC), the relative unemployment of nonwhites versus whites (UNDIF), relative prices (not shown) and endowment per student (ENDOW).

B) Sub-Samples of Data

Table 2b depicts how the three budget share measures have changed from 1977-2001 in different sub-samples of the states. Though none of the reported changes within each category are statistically different from one another at the 95% level, several glaring patterns stand out. It appears that non-reform states, non-northeast states, low density states and single party states have cut their EDSHARES the most, while two-year budget cycle states, court reform states, limited governor power states, politically competitive and multiparty states have cut their HESHARES the most Finally, it appears that students have benefited over institutions in single-year budget cycle states, governor power states, dense states and multiparty states.

When the baseline models are re-estimated on these different sub-samples of data, a number of interesting patterns emerge. Some of the patterns indicate that the baseline results were driven only by a particular sample of states, and some indicate that the lack of evidence of impacts in baseline regressions were due to confounding effects in different samples.[92] Five broad observations are worth highlighting; appendix table 2 summarizes more of the findings.

First, from estimating each equation separately for the years 1972-1982, 1983-1992 and 1993-2001, it is apparent that changes in economic factors are increasing in importance on EDSHARES and HESHARES over time. The most concerning individual result was that while a 1 percentage point increase in the unemployment rate between 1972-1982 resulted in a fall in HESHARES by 0.1 points, today a similar increase results in nearly a half point fall in the HESHARE.[93]

Second, I find evidence that states with funding formulas respond more dramatically to changes in enrollment pressures than do non-formula states, as expected. Further, very few variables are significant in the HESHARE equation estimated on the formula states, indicating that funding formula states may do a better job at insulating higher education from the budget axe than non-formula states.

Third, there is evidence that changes in competing interests (HEALTH, CRIME) and federal transfers (FEDTRAN) have a substantial impact on EDSHARES depending on the sub-sample of states one looks within. For example, in states where governors have power to reduce appropriations without legislative approval, and in states that operate on a two-year budget cycle, increases in federal grants per capita result in sizable decreases in the education budget share. Further, I find evidence that the increasing cost of health care has crowded out education in states that operate on a single-year budget cycle, in states with multi-party governments, in states where governors have significant power, and especially in high density states.

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[92] I only report differences that are statistically different with at least 90% confidence. A complete analysis will appear in an appendix to my dissertation.

[93] It is also worth noting that the positive impact of SAT on INSHARES in table 3 is due to the positive effect this variable had on institutions in the 1970s. There is a statistically significant, and sizable, negative effect in the most recent decade – indicating that as high school student quality increases, states are increasingly turning to student aid programs, likely in an attempt to keep these students from leaving the state.

Fourth, the impacts of racial heterogeneity on the HESHARE and INSHARE equations have been increasing over time. With respect to the HESHARE, increasing ethnic heterogeneity across age groups have led to the largest declines in states that exercise more control over its public institutions, in non-formula states and in those where governors have significant power over appropriations cuts. Further, in the INSHARE equation, increasing ethnic heterogeneity has caused institutional shares to fall in states with annual budget reviews, in less densely populated states and in those with a high degree of political competition.

Fifth, though column (ii) of table 3 indicates that an aging state population looks favorably on higher education, it turns out that this result is driven by the impact the aging population had in the 1970s. Regression estimates indicate that in the 1990s, as the share of the population that is over 65 increased by 1 percentage point, the HESHARE fell by 0.56 points. This effect is statistically different than the effect in the 1970s with more than 99% confidence. Further, the impact (favorable) of aging in the HESHARE and INSHARE equations is driven by states outside of the Northeast. There is also evidence that the impact of an aging population has larger effects when political competition is greatest.

C) Tuition

Tuition rates at public higher education institutions are determined by the level of state support (Lowry 2001, Rizzo and Ehrenberg 2004), and are often times implicitly set by the legislatures or governors in a state. In just one of many examples, the state of Massachusetts and the University of Massachusetts agreed to keep tuition very low in the 1990s in return for strong support from the state, but are now considering changing this policy.[94] In any case, just as federal legislators are loathe to increase the maximum value of the Pell grant due to concerns about the "Bennett Hypothesis", state legislators may respond to increasing tuition rates by cutting future appropriations, giving rise to a vicious cycle. Higher tuition rates may also cause future appropriations to be cut simply because they generate a distaste

[94] Jeffrey Selingo, *Chronicle of Higher Education*, 2/27/03. Under Governor Romney's plan, the state's flagship public campus, the University of Massachusetts at Amherst, would be spun off "to become a premier research university." Making it independent from the system, the governor said, would allow the institution to increase tuition rates to be more in line with other public flagships so it could "more successfully recruit out-of-state students and compete for top research faculty and grants."

for higher education. Since, tuition rates are also likely a function of a long history of state appropriations as well, it would be very difficult to estimate its impact on current budget shares.

The results of several papers uncover mixed evidence on the concurrent relativity between state appropriations and tuition in the cross-section. Lowry (2001) finds no evidence that tuition rates affect state appropriations at the institutional level; Koshal and Koshal (2000) find limited evidence of a relationship in a single year state level analysis; and Strathman (94) finds that states that charge $1 more in tuition tend to have lower state appropriations by 93 cents. Though the authors each attempt to control for the endogeneity of tuition, these cross-section results are likely confounded by omitted variables, and cannot be used to conclusively say how within a state funding for higher education is expected to change as tuition rates increase.

I re-estimate the HESHARE regression including a one period lag of the enrollment weighted average tuition at four-year public institutions in a state as an explanatory variable.[95] Coefficient estimates on the one period lagged tuition suggest that when tuition increases by $1,000 one year prior to this budget cycle, legislatures respond by cutting the HESHARE by 3.4 points. Though the estimates of the other explanatory variables in the model are unaffected by this change, I also test a specification in which the one period lag of tuition is instrumented for by lagged values of variables that are expected to have an impact on tuition, but that might not be expected to directly impact HESHARES one year later.[96] The results are striking and indicate that when lagged tuition increases by $1,000 within a state, HESHARES are slashed by 6.3 points, with no resulting changes in the other estimated parameters.

[95] Durbin-Wu-Hausman tests indicate that *in changes* the one period lead, the current period level and one period lag are all endogenous in the HESHARE equation. Tests also indicate that the two-period lead and two-period lag are not endogenous. The test is executed by regressing the suspected endogenous variable on all other exogenous variables and computing the residuals from this regression. The test for endogeneity is simply a t-test on the coefficient of this residual when it is included in the original outcome equation along with the suspected endogenous variable.

[96] These variables include combinations of: enrollments, share of enrollments in two-year programs, share of enrollments in graduate programs, regional nonresident tuition rates, average faculty salaries (or a proxy for this), share of enrollments in private higher education, share of PhD awarded in sciences, research dollars per faculty in the state and some specifications with further lags of tuition.

Though these results should be viewed with caution, they are very suggestive.[97] Real average public tuition rates at four-year institutions have grown by approximately $1,500 since 1972. The coefficient estimate above indicates that HESHARES fell by almost 9.5 percentage points as a result of increasing tuition rates – explaining a majority of the missing 11 percentage point decline from above.

Sensitivity Analysis and Interpretations

That so little of the fall in HESHARES seems to be explained by changes in observable factors suggests that the functional forms of the baseline estimates are misspecified. However, log-log, linear-log and log-linear specifications, among others, do not yield any addition insight into these causes.[98]

There are statistical and pragmatic concerns that will influence the way the results should be interpreted. Since the outcomes of interest in my estimating equations are proportions with restricted values between zero and one, one would suspect that my data are not normally distributed. However, scatter plots of both EDSHARE and HESHARE both within and across states indicate that this is not the case, while the distribution of INSHARE appears to be slightly skewed to the right. Regardless, estimates of regressions that "normalize" the data yield qualitatively identical results to the raw data, so I eschew their presentation here. A second concern is that OLS regression predictions are not restricted to fall between zero and one. Again, this is of little concern in this paper because all of the predicted values from my OLS regression estimates fall within this range, and also because regressions estimated using a logit-transformation of the budget shares produce similar results to the non-transformed regressions.[99]

While the previous concerns were largely cosmetic, the following two are more substantial because they have the potential to affect the parameter estimates in each of the regressions.[100] The first

[97] For instance, some schools will increase tuition in a year in anticipation of *future* appropriations cuts, making it difficult to disentangle the impacts of tuition and state support on each other.

[98] These estimates are available in the appendix to my dissertation. Log-log specifications indicate that the income elasticity in the EDSHARE equation is –5 and in the HESHARE equation is +5. These results simply suggest that the education budget is less income elastic than the overall general fund budget and that the higher education budget is more elastic than the overall education budget.

[99] A logit transform of a variable Y is ln[Y / (1-Y)]. Also called the "log-odds" ratio, this transformation results in the regression predictions being constrained between 0 and 1.

[100] An issued analyzed more deeply in my dissertation is whether or not these three equations are determined simultaneously, and more specific, recursively. If one believes that changes in the EDSHARE affect changes in the HESHARE, and that changes in the HESHARE affect changes in the INSHARE, then finding that the higher branch

concern results from the long time-series contained in my panel. I have found evidence that the crucial orthogonality assumption required for OLS estimates to be unbiased is violated due to time series correlation in the regression residuals. I computed the residuals from all three baseline regression equations and estimated a variety of regressions of these residuals on their one and two period lags. The results indicate that approximately 2/3 of the variation in today's residuals can be explained by one period lagged residuals. When the second lag is added, the same total amount of variation is explained, except with ½ due to the one-period lag and 1/6 due to the two-period lag.[101] If included explanatory variables are correlated with these lagged residuals, then the parameter estimates in my regressions will be biased. This bias may be exacerbated when lagged dependent variables are added to the model.[102]

The second concern is that the prices included in the EDSHARE and HESHARE equation are endogenous. Aside from the obvious fact that the earnings of public employees are a function of the level of state support for that particular budget item, in the case of education, higher earnings are highly correlated with educational quality – which might also be a choice variable for the legislature. To complicate the interpretation of the price variables, in some states it is the case that higher education is heavily subsidized by the federal government in ways which are not at all related to federal taxes, therefore the relationship between the true marginal cost of higher education and the price as seen by voters/legislatures is unstable (Alexander 2001, Bound et al 2001).[103]

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budget allocations are endogenous in the lower branch equations would cast doubt on the validity of the separability assumption. Preliminary results indicate that OLS and IV estimates of the higher level budget shares in the lower level equations are vastly different, though the remaining exogenous variables are unaffected. In part, the results indicate that each percentage point increase in the EDSHARE results in a 0.6 point fall in the HESHARE while a one point increase in the HESHARE results in a 0.6 point fall in the INSHARE. However, I should caution that these estimates have not satisfactorily controlled for the spurious negative correlation introduced between the budget share measures.

[101] This is true both in states that operate on a single year budget and on a biennial budget, so another factor must be causing this correlation.

[102] Using methods derived in Baltagi and Wu (1999) I re-estimate the baseline models attempting to control for the autocorrelation in two ways. Both methods do a bit of violence to the reported baseline estimates in that there is a substantial loss of efficiency and the impacts of the elderly, unemployment rate and court reforms disappear in these models.

[103] A detailed discussion of the treatment of price variables can be found in an appendix to work in progress. To summarize, statistical tests of the price endogeneity in both the EDSHARE and HESHARE equations provided mixed results. The tests amount to including residual values from regressions of the suspected endogenous variables on all of the exogenous variables in the original outcome equations. Simple t-tests on the residual in these

Nonetheless, regression estimates in equations that attempted to control for the potential endogeneity of the price variables were very similar to those where the prices were dropped, or treated as exogenous. As a result, for expository purposes, the relative price measures were included in the above baseline regressions.[104]

The results should be interpreted with caution because included variables may not only capture the demand for education spending, but also differences in technology or other supply factors within states with different demographic and other characteristics. For example, it may seem reasonable to exclude OUTMIG from the higher education production function, and so impacts on HESHARE from changes in migration likely result from demand side factors alone. However, changes in the size of the college-aged cohort are more difficult to interpret because economies of scale could make it possible to deliver the same education to larger cohorts with less than proportional increase in spending.

Policymakers should be concerned with the true functional form of legislative utility functions. This understanding is important to know whether certain marginal conditions require influence, or rather an expansion of the budget is necessary to improve the fortunes of public higher education. If the underlying utility function depicted by my utility-tree is *homothetic*, then the cost of reaching higher levels of utility must be proportional to the level of utility – budget shares are independent of utility levels and wealth levels. If this is the case, then simply increasing the size of the education budget will do nothing to alter the increasing substitution of K12 for higher education services. Consumer demand studies typically reject this functional form. In a rough attempt to understand this, I re-estimated the HESHARE and INSHARE equations by including a measure of the total size of the education budget in the HESHARE equation and the size of the higher education budget in the INSHARE equation. The estimates on the budget levels indicate that increasing the size of the education budget will not affect the

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augmented regressions indicated that prices are exogenous in the EDSHARE equation and endogenous in the HESHARE equation.

[104] In the EDSHARE equation, one instrument for the relative price of education instructors to non-education employees was an estimate of the share of education employees that are unionized relative to the share of non-education public sector workers that are unionized. In the HESHARE equation, the instrument was an estimate of the share of public higher education instructors that were unionized to the share of all education instructors that were unionized.

HESHARE, but increases in the size of the higher education budget, lead to a smaller share of resources going to institutions.[105]

The results presented above may be hard to interpret literally because there may be cross-variable utility effects associated with higher education spending. For example, spending on public higher education may reduce the incidence of crime and thereby raise the utility of everybody, not just the college aged population when additional dollars are allocated to higher education. Therefore, my estimates may overstate the direct importance of cohort sizes and other variables on budget share changes. This difficulty is related to the fact that it is nearly impossible to control for all factors that affect state legislative decisions. For example, I do not include information on state-wide programs involving property tax limits. Though their impact on budget shares is unclear, their use is increasing across the country, and varies by income and demographic conditions – which may explain some of the variation in the estimated coefficients on these variables above. The impact of these property tax exceptions on a variety of outcomes is something I will investigate more deeply in the future.

Finally, the aggregated data used in state-level analyses abstracts from a large degree of within state heterogeneity in the explanatory variables, which likely affects budget outcomes. If this heterogeneity is constant over time, then my within estimation techniques will control for it, however, there is reason to believe that variables such as the homogeneity of households with college aged children have changed over time. Future work should make greater efforts to incorporate this variation.

VI. Conclusion

Though no universally accepted structural model of political equilibrium exists, reduced form econometric specifications for public spending on public education yield valuable insights into why public higher education is facing an alarming fiscal crisis. The empirical evidence in this paper suggests that all of the observed four percentage point fall in education's share of state general fund budgets has been attributable to changes in the income distribution within states. Though measures of competing

[105] There is a spurious negative correlation built into these estimates, which I will address in future work.

interest groups seem to not have crowded out education spending, their effects are confounded by them having differential impacts in different sub-samples of states.

While collectively, observable within state changes are unable to explain the six percentage point drop in the share of the education budget allocated to public higher education since 1977, there is substantial evidence that the discretionary nature of higher education spending and its ability to independently raise revenues have caused its decline. Dynamic panel estimates indicate that states do not practice strictly incremental budgeting, and exercise the most discretion over the determination of the higher education – K12 split than among other budget decisions. Further, estimates on a sample split by three different time periods indicate that the sensitivity of higher education budget shares to declining labor market conditions has increased over time. Attempts by public institutions to respond to lagging state appropriations by increasing tuition or private fundraising efforts have been met with substantial chagrin by state legislatures and calls into question exactly what institutions are expected to do in the face of budget difficulties as they rapidly spiral toward the private equilibrium.

The 3.9 percentage point decline in the share of higher education budgets allocated to public institutions, as opposed to students, can be fully explained by changes in the relative size of the college aged cohort, increases in nonresident tuition rates in the geographic region and by a movement to merit aid programs in 10 states over the past decade. Investigation of the merit aid result reveals that the increasing popularity of non-means tested aid has not been altruistically motivated. I find evidence that these targeted programs are used to redistribute income to well-off families and to avoid providing broad based institutional support that would benefit economically disadvantaged members of the populace. A hypothesis advanced by current president of Murray State University, King Alexander (2001), that federal aid programs provide perverse incentives for higher education funding in that low tax effort states are rewarded with more federal aid than high tax effort states, is supported by these results as well. I find that as more households in a state become eligible to receive a federal Pell grant, that states respond by moving aid away from institutions and toward students. In fact, these perverse incentives may account for some of the unexplained fall in the HESHARES from above. The more support a state provides for its

public institutions, and hence the lower the tuition rates are, the less federal aid its students will be eligible to receive. This is consistent with the result in Rizzo and Ehrenberg (2004) that increases in federal Pell grant generosity and state need-based grant aid awards result in increases in in-state tuition levels at flagship public universities.

Several additional results deserve attention. Similar to other studies, I find that court mandated K12 equalization schemes have resulted in substantial increases in K12 spending within states. However, unlike these studies I find that 36% of the total spending increase has come at the expense of public higher education – representing $280 per full-time public college student in an average sized state. My results also indicate that ethnic heterogeneity across age cohorts results in state funding being allocated to the schooling cohorts that look most similar to the non-school age population in a state.

Three questions naturally arise when considering these results. First, aside from the unlikely possibility that much of public higher education's decline has been a result of retaliation, or taxpayer distaste resulting from tuition and private giving increases, what other factors might have caused its dramatic decrease in public priority? Second, how will students likely be impacted by falling state support? Last, what if anything can be done to stop the bleeding, and what does this paper suggest for the course of future research?

Many of the likely reasons for public higher education's decline are difficult to quantify, but may shed light on policy recommendations and a roadmap for future research. Perception surely represents a challenge for our public institutions. When laypeople think of college, an image of the ivory clad walls and expansive quadrangles of Harvard spring to mind and it is hard for them to disentangle this vision with the reality at many public institutions. For example, a common perception in Texas is that the public system is egregiously wealthy because the Permanent (endowment) Fund is triple the size of the endowment at Rice. Never mind that the payout on this fund supports the operations of seventeen branch campuses and constitute no more than $1/10^{th}$ of the revenues per student than the Rice endowment generates. Many taxpayers, politicians, and philanthropic organizations have the belief that their dollars will go further if allocated to more "needy" causes. Further, as the private rate of return to education

continues to increase it is incumbent upon the public higher education community to reemphasize the importance of broad based access, their public service mission, that it is a provider of jobs and essential for economic development.[106]

Higher education is increasingly becoming a political issue. Clearly the rise of merit aid programs has been politically motivated, but so too are initiatives to institute performance and accountability standards (which are notoriously difficult to measure and implement). Some of the budget share declines may have occurred in response to the growing use by the flagship public universities of nonresident enrollments. They might also be emblematic of implicit agreements between public universities and legislatures to trade-off less political oversight in exchange for less state funding.

Recent work by Bound, et al (2001) provides additional insight. They find that states may not have an incentive to invest in higher education because the flows of college educated labor produced in a state have little impact on the stock of college graduates that work in a state. If this is the case, then it might make sense for a state to devote its resources to areas where it has a comparative advantage over other states. Finally, it might also be the case that statewide property tax initiatives in many of the states have contributed to the declining higher education share. In work just underway, I am looking at the question of whether the increased state burden for K12 expenditures as a result of local property tax exemptions for particular demographic groups has come at the expense of higher education expenditures.[107]

A continued decline in state support for public institutions will result in innumerable negative consequences for the students that attend, or hope to attend them in the future. Examining the impacts of these declines on a number of student and institutional outcomes is a fertile ground for future research (in terms of the specific impact on student outcomes and institutional quality). Among the consequences are:

[106] The ratio of income of adult male college graduates to high school graduates has increased steadily from 1.25 in 1980 to 1.65 in 2000 with a slight dip in the mid-90s. In future work, I will attempt to recover measures of the rate of return to higher education by state to see how funding priority has changed as these returns have changed.
[107] This work is primarily focused on more fundamental questions relating to school district expenditures, particularly due to New York State's STAR program.

continued tuition increases[108]; movement away from full-time tenure tracked faculty toward part-time faculty and graduate student instructors; increases in student-faculty ratios; an erosion of liberal arts and humanities programs in favor of more practical and professional programs; increases in time to degree and dropout rates; fall in public service expenditures; increased loan burden on students attending college; a limitation of program offerings; and a multitude of additional factors. Further, future budget cutbacks are likely to have a disproportionate negative impact on community colleges, who rely on a larger share of their operating budget from state sources and where a larger share of minority and first time college attendees are enrolled. While these changes may not be dramatic in any single year, over a period of time, the resource gap and faculty quality gap between the publics and privates will be so large as to render a private education and a public education two entirely different products.[109]

A recent issue of the *Chronicle of Higher Education* asked a variety of higher education experts how they would deal with the tuition crisis facing our institutions, particularly at the publics.[110] While laudable, one can't help but feel uneasy with the topic's implicit acceptance that policies of broad state support and low tuition are historical relics. However, there are steps that states and institutions can take to ensure that this doesn't happen. It would be comforting to see comparative rates of return analyses on different state spending items to justify why higher education is falling out of favor, though those are notoriously difficult to calculate. Among the other steps include an increased participation in tuition reciprocity programs and cross-institutional cooperation.[111] Institutions can attempt to secure multi-year budget appropriations from legislatures in order to stop the destructive pattern of mid-year budget cuts. State tax codes can be revised and our public institutions can do a better job of marketing the "local

[108] Although high tuition, high need-based aid strategies are actually quite progressive, the sticker shock created by the high sticker prices, especially at two-year colleges, may scare those away who are at the margin of college attendance. The College Board estimates that the largest public high school class on record will graduate in 2008, and that a majority of these students will come from minority populations and those that would be the first generation to attend college – so the sticker shock is of considerable concern.
[109] As Ehrenberg and Brewer (96) have shown that there is already a distinct advantage to attending an elite private college.
[110] September 19, 2003 (Volume 50 Issue 4).
[111] See www.ilr.cornell.edu/CHERI and click on "surveys" for a description of these reciprocity programs.

public good" aspect of their product.[112] While programs like funding formulas may be popular ways to secure financing for institutions, the determination of the formulas themselves are subject to political debate, and may also result in a sub-optimal distribution of student types within institutions due to institutional attempts to take advantage of these formulas.

Funding for education is a (less-than) zero sum game played out in statehouses across the nation. States decide how much to spend on education, then decide how much to allocate to each sector - and for years have acted as if K12 funding is more sacred than higher educational institutional spending. For instance, each state maintains a "rainy day fund" that is supposed to smooth the effects of budget shocks. In 2001, New York met the needs for a 5% K12 budget increase and maintained the current levels of its student aid program (Tuition Assistance Program) out of this fund, but none of it was tapped for SUNY and CUNY institutional needs. In the 2003-2004 fiscal year, 24 of 44 states surveyed by the State Higher Education Executive Officers indicated that they expected to receive decreases in the level of state spending for public higher education and in the 18 states that expected increases, in real per student terms funding is expected to remain flat. Demographic changes and the higher profile of K12 education do not bode well for public higher education's future as well. A dramatic shift in public and legislative priority is required to ensure that future generations of students have access to public higher education that is of comparable quality to what is available today. An even larger commitment will be required to make this endeavor affordable and to keep our public institutions from falling further behind their private counterparts.

[112] It is entirely conceivable that large portions of a state population can be mobilized to support higher education. In fact, one just needs to look to the popularity of Division I Athletics programs at the major universities as a model to build upon. For example, Memorial Stadium in Lincoln, Nebraska becomes the 3rd largest city in the state on the day of football games and the former head football coach is now a powerful U.S. Congressman.

References

Adams, Walter. 1977. "Financing Public Higher Education." *American Economic Review*. 67(1): 86-89.

Alexander, F. King. 2001. "Disparities in State Tax Effort for Financing Higher Education," presented at Cornell Higher Education Research Institute Higher Education Policy Research Conference: "Financing Higher Education Institutions in the 21st Century", (May 2001).

Arellano, M. and S. Bond. 1991. "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations." *The Review of Economic Studies*. 58: 277-297.

Ashenfelter, Orley C. and Ronald G. Ehrenberg. 1975. "The Demand for Labor in the Public Sector." in Daniel S. Hamermesh, ed. *Labor in the Public and Nonprofit Sectors.* Princeton, NJ: Princeton University Press.

Baltagi, Badi H. and Ping X. Wu. 1999. "Unequally Spaced Panel Data Regressions with AR(1) Disturbances." *Econometric Theory.* 15(6): 814-823.

Biggs, Michael L. and Jayasri Dutta. 1999. "The Distributional Effects of Education Expenditures." *National Institute Economic Review*. 68-77.

Borcherding, Thomas E. and Robert T. Deacon. 1972 "The Demand for the Services of Non-Federal Governments." *American Economic Review*. 62(5): 891-901.

Bound, John, Jeffrey Groen, Gabor Kezdi and Sarah Turner, "Trade in University Training: Cross-State Variation in the Production and Use of College-Educated Labor," Cornell Higher Education Research Institute Annual Conference, (May 2001).

Bowen, William. 1977. "Economic Problems Confronting Higher Education: An Institutional Perspective." *American Economic Review*. 67(1): 96-100.

Cardak, Buly A. 1999. "Heterogeneous Preferences, Education Expenditures and Income Distribution." *Economic Record*. 75(228): 63-76.

Clotfelter, Charles T. 1976. "Public Spending for Higher Education: An Empirical Test of Two Hypotheses." *Public Finance.* 31(2) 177-195.

Cohen, L.R. and R.G. Noll. 1998. "Universities, Constituencies, and the Role of the States." In R.G. Noll ed. *Challenges for Research Universities*. Washington, DC: Brookings Institution Press.

Coughlin, C.C. and O.H. Erekson. "Determinants of State Aid and Voluntary Support of Higher Education." *Economics of Education Review*. 5(2): 179-190.

Creedy, J. and Francois, P. 1990. "Financing Higher Education and Majority Voting." *Journal of Public Economics.* 43(2): 181-200.

Deaton, Angus and John Muellbauer. 1980. *Economics and Consumer Behavior.* Cambridge: Cambridge University Press.

Directory of Faculty Contracts and Bargaining Agents In Institutions of Higher Education (1977-1996). Richard Hurd and Amy Foerster with Beth Hillman Johnson. Douglas H. White Director The National Center for the Study of Collective Bargaining in Higher Education and the Professions, School of Public Affairs, Baruch College - The City University of New York.

Duflo, Esther. 2001. "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment," *American Economic Review*. 91: 795-813.

Dynarski, Susan. (Forthcoming Spring 2004) "The Consequences of Merit Aid." in ed. Caroline M. Hoxby's College Choices: The Economics of Which College, When College, and How to Pay For It. Cambridge: The University of Chicago Press.

Ehrenberg, Ronald G. 2003. "Financing Higher Education Institutions in the 21st Century." Address at the 2003 annual meeting of the American Educational Finance Association.

-----. 2000. *Tuition Rising*. Cambridge, MA: Harvard University Press.

-----. 1973. "The Demand for State and Local Government Employees." *American Economic Review*. 63(3): 366-379.

Ehrenberg, Ronald G. and Dominic Brewer. 1996. "Does It Pay to Attend an Elite Private College?" *Research in Labor Economics* 15.

Ehrenberg, Ronald G. and Christopher Smith. 2001. "The Sources and Uses of Annual Giving at Private Research Universities." Prepared for presentation at the Cornell Higher Education Research Institute (CHERI) conference on "Financing Higher Education Institutions in the 21st Century," Ithaca, NY, May 22-23.

Fernandez, Raquel and Richard Rogerson. 1998. "Public Education and Income Distribution: A Dynamic Quantitative Evaluation of Education-Finance Reform." *American Economic Review*. 88(4): 813-833.

Fernandez, Raquel and Richard Rogerson. 1995. "On the Political Economy of Education Subsidies." *Review of Economic Studies*. 62: 249-262.

Fisher, Ronald C. 1988. *State and Local Public Finance*. Glenview, IL: Scott Foresman

Fortin, Nicole. 2002. "Does College Education Spending Reduce Wage Inequality? Cross-State Evidence from the 1990s." Presented at Annual Meetings of the Society of Labor Economists, Baltimore, MD May 2002.

Goldin, Claudia and Lawrence Katz. 1999. "The Shaping of Higher Education: The Formative Years in the United States, 1890-1940." *The Journal of Economic Perspectives.* 13(1): 37-62.

Griswold, C.P. and G.M. Marine. 1996. "Political Influences on State Tuition Aid Policy: Higher Tuition/Higher Aid and the Real World." *Research in Higher Education*. 37: 244-278.

Groen, Jeffrey A. and Michelle J. White. 2003. "In-State versus Out-of State Students: The Divergence of Interest between Public Universities and State Governments." NBER Working Paper No.9603.

Groen, Jeffrey A. 2003. "The Effect of College Location on Migration of College-Educated Labor." Forthcoming in *Journal of Econometrics*.

Hansen, W.L. and B. A. Weisbrod. 1969a. *Benefits, Costs, and Finance of Public Higher Education*. Chicago.

-----. 1969b. "The Distribution of Costs and Direct Benefits of Public Higher Education: The Case of California." *Journal of Human Resources.* 4: 176-191.

Hearn, J.C., C.P. Griswold and G.M. Marine. 1996. "Region resources, and reason: a contextual analysis of state tuition and student aid policies." *Research in Higher Education.* 37: 241-278.

Hoenack, Stephen A. and Daniel J. Pierro. 1990. "An Econometric Model of a Public University's Income and Enrollments." *Journal of Economic Behavior and Organization*. 14: 403-423.

Holbrook, Thomas M. and Emily Van Dunk. 1993. "Electoral Competition in the American States." *The American Political Science Review*. 87(4): 955-962.

Hossler, D., Lund, J., Ramin, J., Westfall, S. and Irish, S. 1997. "State Funding for Higher Education: the Sisyphean Task." *Journal of Higher Education.* 68: 160-190.

Hoxby, Caroline. February 9, 2000 Testimony to the United States Senate, Committee on Governmental Affairs.

-----. 1998. "The Effects of Geographic Integration and Increasing Competition in the Market for College Education." Harvard Economics Department Working Paper.

-----. 1997. "How the Changing Market Structure of U.S. Higher Education Explains College Tuition." National Bureau of Economic Research Working Paper Number 6323.

Hovey, Harold. 1999. *State Spending for Higher Education in the Next Decade: The Battle to Sustain Current Support.* Prepared by State Policy Research, Inc. for The National Center for Public Policy and Higher Education.

Koshal, Rajindar K.and Manjulika Koshal. 2000. "State Appropriation and Higher Education Tuition: What Is the Relationship?" *Education Economics.* 8(1): 81-89.

Krueger, C. 2001. *Merit Scholarships*. Denver, CO: Education Commission of the States.

Ladd, Helen F. and Sheila E. Murray. 2001. "Intergenerational Conflict Reconsidered: County Demographic Structure and the Demand for Public Education." *Economics of Education Review*. 20: 343-357.

Layzell, Daniel T. & Jan W. Lyddon. 1997. "Budgeting for Higher Education at the State Level: Enigma, Paradox and Ritual." In *ASHE-ERIC Higher Education Report*, No.4, (Washington, DC, ERIC Clearinghouse on Higher Education, The George Washington University).

Lee, Seong Soo, Rati Ram and Charles W. Smith. 1999. "Distributive Effect of State Subsidy to Undergraduate Education: The Case of Illinois." *Economics of Education Review.* 18: 213-221.

Leslie, Larry, and Ramey, G. 1986. "State Appropriations and Enrollments: Does Enrollment Growth Still Pay?" *Journal of Higher Education*. 57: 1-19.

Long, Bridget Terry. "How Do Financial Aid Policies Affect Colleges? The Institutional Impact of the Georgia HOPE Scholarship." Forthcoming in the *Journal of Human Resources.*

Lowry, Robert C. 2001. "The Effects of State Political Interests and Campus Outputs on Public University Revenues." *Economics of Education Review.* 20: 105-119.

MGT of America. 2001. "Funding Formula and Performance Funding Consulting Services." Discussion Paper: Issues and Models of Performance Indicator Usage and Performance Funding in Higher Education. Austin.

Moretti, Enrico. 2003. "Estimating the Social Return to Higher Education: Evidence from Longitudinal and Repeated Cross-Sectional Data." Forthcoming in *Journal of Econometrics.*

Murray, Sheila E., William N. Evans and Robert M. Schwab. 1998. "Education-Finance Reform and the Distribution of Education Resources." *American Economic Review*. 88(4) 789-812.

Nechyba, Thomas J., "Mobility, Targeting, and Private-School Vouchers," American Economic Review 90, (March 2000): 130-146.

Nechyba, Thomas J., "Existence of Equilibrium and Stratification in Local and Hierarchical Tiebout Economies with Property Taxes and Voting," Economic Theory 10, (1997): 277-304.

Nechyba, Thomas J., "Local Property and State Income Taxes: The Role of Interjurisdictional Competition and Collusion," Journal of Political Economy 105, (April 1997): 351-384.

Nechyba, Thomas J., "A Computable General Equilibrium Model of Intergovernmental Aid," Journal of Public Economics 62, (1996): 363-397.

Niskanen, William A. 1968. "Nonmarket Decision Making: The Peculiar Economics of Bureaucracy." *American Economic Review.* 58(2): 293-305.

Painter, Gary and Kwi-Hee Bee. 2001. "The Changing Determinants of State Expenditure in the United States: 1965-1992." *Public Finance and Management.* 9(4): 370-392.

Peterson, R.G. 1976. "Environmental and Political Determinants of State Higher Education Appropriations Policies." *Journal of Higher Education*. 47(5): 523-545.

Poterba, James M. and Kim S. Rueben. 1995. "The Effect of Property-Tax Limits on Wages and Employment in the Local Public Sector." *American Economic Review* 85: 384-389.

Poterba, James M. 1997. "Demographic Structure and the Political Economy of Public Education," *Journal of Public Policy and Management* 16: 48-66.

-----. 1994. "State Responses to Fiscal Crises: The Effects of Budgetary Institutions and Politics." *Journal of Political Economy.* 102(4): 799-821.

Reindl, Travis and Dana Brower. 2001 "Financing State Colleges and Universities: What is Happening to the "Public" in Public Higher Education?" Presented at the 2001 Cornell Higher Education Research

Institute Conference, *Financing Higher Education Institutions in the 21st Century*, Cornell University, Ithaca, NY, May 22-23, 2001.

Rizzo, Michael J. and Ronald G. Ehrenberg. (Forthcoming Spring 2004) "Resident and Nonresident Tuition and Enrollment at Flagship State Universities." in ed. Caroline M. Hoxby's *College Choices: The Economics of Which College, When College, and How to Pay For It.* Cambridge: The University of Chicago Press.

Rothschild, Michael and Lawrence J. White. 1993. "The University in the Marketplace: Some Insights and Some Puzzles." in eds. Charles T. Clotfelter and Michael Rothschild, Studies of Supply and Demand in Higher Education. Chicago: The University of Chicago Press.

Ruggles, Steven and Matthew Sobek et al. (2003). Integrated Public Use Microdata Series (IPUMS): Version 3.0 Minneapolis: Historical Census Projects, University of Minnesota.

Sprumont, Yves, "Equal Factor Equivalence in Economies with Multiple Public Goods," Social Choice and Welfare 15, (1998): 543-558.

Strathman, James G. 1994. "Migration, Benefit Spillovers and State Support of Higher Education." *Urban Studies*. 31(6): 913-920.

Stone, R. 1954. "Linear Expenditure Systems and Demand Analysis: An Application to the Pattern of British Demand." *Economic Journal*. 65: 511-527.

Strathman, James. 1994. "Migration, Benefit Spillovers and State Support of Higher Education." *Urban Studies.* 31(6): 913-920.

Strotz, Robert H. 1959. "The Utility Tree – A Correction and Further Appraisal." *Econometrica*. 27(3): 482-488.

Strotz, Robert H. 1957. "The Empirical Implications of a Utility Tree." *Econometrica*. 25(2): 269-280.

Toutkoushian, Robert K. and Paul Hollis. 1998. "Using Panel Data to Examine Legislative Demand for Higher Education." *Education Economics*. 6(2): 141-157.

UNESCO. 2003. "Financing Education - Investments and Returns." Paris: UNESCO Publishing.

Winston, Gordon C. 1999. "Subsidies, Hierarchy and Peers: The Awkward Economics of Higher Education." *Journal of Economic Perspectives*. 13(1): 13-36.

Wooldridge, Jeffrey M. 2002. *Econometric Analysis of Cross-Section and Panel Data*. Cambridge, Massachusetts: The MIT Press.

Table 1
Summary Statistics for Baseline and Selected Variables and Years

	1977			1989			2001		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Income and Budget Measures:									
Median Household Income (1980 earliest	33,457	24,321	51,100	34,742	23,518	47,322	40,402	28,445	52,744
75-25 Income Ratio (1980 earliest)	3.1	2.7	3.7	3.2	2.6	4.0	3.3	2.8	4.0
Per Capita Federal Transfers	557	302	1,587	606	360	1,569	992	533	1,869
Demographics:									
Median Age	28.4	23.8	33.5	32.1	26.0	35.9	35.5	27.1	38.9
Share of Population 5-17	25.6	22.0	29.4	20.6	16.8	29.6	20.3	17.6	25.2
Share of Population 18-24	14.4	12.3	17.5	11.9	10.0	13.3	10.5	8.5	15.7
Share of Population > 65	11.4	2.7	17.9	13.3	4.3	19.5	13.4	6.2	18.7
Percent Nonwhite (1981 earliest)	16.9	1.4	67.0	18.5	1.8	68.0	20.5	3.1	75.7
Share 5-17 Population Nonwhite	20.4	0.6	70.7	22.9	0.7	73.0	25.8	4.3	83.8
Share 18-24 Population Nonwhite	20.0	2.5	63.4	22.5	3.5	65.5	25.3	4.8	75.2
Share >25 Population Nonwhite	15.7	1.2	68.9	17.2	1.5	68.7	21.2	2.2	63.0
Share > 65 Population Nonwhite	11.6	0.4	72.0	11.8	0.6	72.6	11.6	1.0	77.2
Share Pop 25 and Older w/ HS Degree	65.5	50.0	81.5	77.7	63.7	88.1	85.4	78.2	91.7
Share Pop 25 and Older w/ College Deg	15.3	8.3	22.7	20.4	11.1	28.1	25.2	14.8	36.2
In-Migration % (All) (1980, 1990, 2000)	13.0	5.6	32.1	12.0	5.8	29.6	12.0	6.4	27.5
Out-Migration % (All Ages)	10.9	6.3	29.6	10.9	6.3	25.7	9.6	5.7	20.0
In-Migration % (College Age)	21.1	8.4	45.3	20.9	8.4	39.8	21.5	10.3	39.3
Out-Migration % (College Age)	10.8	6.2	29.8	11.7	6.3	26.8	9.5	4.8	20.7
Enrollment Pressure									
Share HE Enroll Privates (1999 latest)	21.0	0.0	56.7	22.0	0.5	59.4	23.9	5.0	61.5
Share K12 Enroll Privates (1981 earliest)	9.4	1.6	19.0	9.5	1.4	18.3	9.2	2.4	16.7
Share HE Enroll 2-Years (1999 latest)	22.5	0.0	53.0	24.6	0.0	52.0	27.3	3.6	56.0
Enrollment Rate (1999 latest)	53.5	6.9	140.0	60.3	22.0	118.3	58.4	30.1	101.2
FTE HE Enrollment (2000 latest)	161,464	9,082	1,074,346	183,833	15,923	1,096,884	214,367	16,290	1,329,270
K12 Enrollment (2000 latest)	871,775	89,295	4,313,926	802,078	93,381	4,618,120	934,034	91,757	6,050,609
Capacity	1.23	0.80	2.08	0.94	0.48	1.81	0.82	0.33	2.14
SAT (1980 earliest)	945	784	1,062	950	836	1,084	1,069	974	1,196
Competing Interests & Economic Conditions:									
Crime Rate (per 100,000) - (1998 latest)	4,968	2,391	8,461	5,234	2,318	9,215	4,714	2,469	7,272
Health (Share >65 x Health CPI) (2000 lat	6.0	1.4	9.5	18.4	5.7	27.2	32.7	14.9	45.8
Unemployment Rate	7.0	3.3	10.4	5.5	2.4	10.9	3.9	2.2	6.6
Unemp. Rate Nonwhites (1978 earliest)	12.3	0.0	22.2	11.2	0.6	26.6	7.3	0.0	16.7
# States with Court K12 Reform	2			9			24		
GSP Share Finance, Ins, Real Est, Svc (197	25.4	18.4	46.6	31.7	15.8	48.7	37.9	23.1	56.1
Share GF Revs - Corp Income Tax	6.1	0.0	13.7	5.6	0.0	13.9	4.0	1.3	12.4
Share GF Revs - Indiv Income Tax	18.3	0.0	41.9	20.9	0.0	44.0	23.9	0.0	47.1
Share GF Revs - Lotteries	0.4	0.0	3.1	1.4	0.0	5.3	1.8	0.0	8.0
Share GF Revs - Sales Taxes	35.4	4.8	62.4	31.2	1.2	66.0	29.9	1.6	66.7
Political Factors:									
# States with Democrat Governor	37			26			17		
Assembly Seats per Senate Seats	3.02	1.67	16.67	2.96	1.67	16.67	2.95	1.67	16.46
Assembly Seats per 100,000 Population	5.9	0.0	47.3	5.3	0.0	36.9	4.6	0.0	32.0
Senate Seats per 100,000 Population	2.1	0.0	7.9	1.9	0.0	8.1	1.6	0.0	7.3
Voting Participation Rate	52.0	22.4	69.5	47.7	6.6	62.3	51.4	33.4	67.4
Higher Education Factors:									
Endowment per Student (1996 latest)	1,562	58	11,432	1,497	0	14,966	2,850	72	21,997
Giving per Student	526	0	2,047	1,143	0	3,841	2,824	0	7,282
Ph.D degrees / BA degrees	3.12	1.18	6.78	3.14	1.16	6.06	3.14	1.03	5.57
Proportion HH w/Inc. Below Pell Max	64.4	43.0	76.8	50.4	32.4	65.3	56.7	42.0	71.0
Research Expenditures per Capita	36	8	203	55	20	129	82	29	174
Share Ph.D awarded in Science and Eng	61.3	33.0	100.0	68.3	45.7	100.0	67.4	35.1	96.3
Avg Instate Tuition at 4-Years (1999 latest	1,637	829	2,968	2,257	1,169	4,719	3,225	1,960	6,894

Note: All dollar values are constant dollars; see http://www.people.cornell.edu/pages/mjr38 for information on additional datc

Table 2a
Representative Budget Measures in $1,000 for FY2001

	General Fund	Education	Higher Education
National Average	*20,866,675*	*7,490,788*	*1,231,462*
Iowa	11,198,506	4,397,048	870,869
New York	89,236,585	23,568,538	3,353,009
North Carolina	28,860,264	11,960,237	2,452,374
Texas	58,183,264	24,804,955	4,086,656

Table 2b
Percentage Point Changes in Outcomes According to State Institutional Characteristics

Institutional Characteristic		ΔEDSHARE	ΔHESHARE	ΔINSHARE
Autonomy of Higher Eduction Institutions	Yes (25 states)	-3.28	-5.77	-3.58
	No (25 states)	-3.85	-6.51	-3.51
Budget Cycle Length	2-Years (23 states)	-3.03	-7.27	-2.81
	1-Year (27 states)	-4.01	-5.17	-4.17
Court Reform State in 2001	Yes (24 states)	-2.42	-7.15	-3.02
	No (26 states)	-4.91	-5.22	-4.03
Funding Formula	Yes (29 states)	-4.23	-5.71	-3.78
	No (21 states)	-2.63	-6.74	-3.22
Governor Can Reduce Appropriations w/out Approval	Yes (37 states)	-3.66	-5.60	-4.26
	No (13 states)	-3.27	-7.68	-1.52
New England / Northeast	Yes (9 states)	-2.04	-5.69	-4.45
	No (41 states)	-3.89	-6.24	-3.35
Political Competition	Competitive (25 states)	-3.29	-6.77	-3.44
	Non-compet. (25 states)	-3.84	-5.51	-3.65
Population Density	Dense (25 states)	-2.96	-6.02	-4.77
	Less Dense (25 states)	-4.17	-6.26	-2.32
Uniparty Government	Yes (43% of state-years)	-5.25	-5.44	-2.62
	No (57% of state-years)	-2.10	-6.40	-3.92

Notes: Represent 1977-2001 changes.
No raw changes are statistically different across categories at 95% confidence level.
Uniparty states not constant over time, so changes are for inconsistent sample.

Table 3: OLS Baseline Regressions for Education's Share of General Fund Budgets and Public Higher Education's Share of the Education Budget - Within Estimates

***Bold 95% significance**, ** italics = 90%*	*EDSHARE* (I)		*HESHARE* (II)	
Median Income in $1,000 (INC)	**-1.27**	*	**0.61**	*
	(0.28)		**(0.23)**	
Squared Income (INC2)	**0.011**	*	**-0.004**	*
	(0.002)		**(0.002)**	
75-25 Income Ratio (INEQU)	**-5.13**	*	**4.12**	*
	(1.81)		**(1.52)**	
Share of Population > 65 Years Old (ELDERLY)	**-0.41**	*	*0.22*	**
	(0.18)		*(0.13)*	
Share of Population Aged 5-24 (SCHOOLAGE)	**0.62**	*		
	(0.12)			
Share Pop. 18-24 / Share Pop. 5-17 (COLRATIO)			**0.13**	*
			(0.04)	
Nonwhite schoolage / Nonwhite non-schoolage (SCHOOLRACERATIO)	1.42			
	(1.10)			
Nonwhite college pop / Nonwhite K12 pop (COLK12RACE)			-0.15	
			(0.14)	
(Nonwhite college pop / Nonwhite K12 pop) *Share Adult Population Nonwhite (RACEINTERACT)			**0.04**	*
			(0.01)	
In-Migration (share population in state today that did not reside here 5 years ago) (INMIG)	0.02		-0.02	
	(0.05)		(0.03)	
Out-Migration (share of population in state 5 years ago that does not reside here today) (OUTMIG)	0.06		**-0.13**	*
	(0.06)		**(0.06)**	
Federal Transfers per Capita ($1,000) (FEDTRAN)	-0.56			
	(0.36)			
Unemployment Rate (UNEMP)	-0.05		**-0.22**	*
	(0.06)		**(0.05)**	
Health Costs (HEALTH)	-0.02			
	(0.06)			
Crime Rate (CRIME)	0.03			
	(0.12)			
Court Reform State (COURT)	**1.18**	*	**-1.19**	*
	(0.30)		**(0.25)**	
Within R^2	0.319		0.663	
Observations	1300		1300	

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. All also include interactions between income level and distribution and EDSHARE and INSHARE include relative price measures, none of which are statistically relevant and measures controlling for private enrollment pressures. In-migration and out-migration for EDSHARE equation are rates for entire population while for HESHARE and INSHARE are calculated for college aged population alone. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Standard errors in (parentheses).

Table 4: OLS Regressions for Institutional Share of Public Higher Education Budgets - Within Estimates

***Bold 95% significance**, ** italics = 90%*	*Baseline* (I)		*"Psuedo-Experiment"* (II)	
Median Income, in $1,000 (INC)	0.23 (0.16)		0.27 (0.17)	
Squared Income (INC2)	-0.001 (0.001)		-0.002 (0.001)	
75-25 Income Ratio (INEQU)	1.59 (1.09)		1.67 (1.07)	
Share of Population > 65 Years Old (ELDERLY)	**0.38** **(0.10)**	*	**0.38** **(0.10)**	*
Share of Population Aged 18-24 (COLLAGE)	**0.275** **(0.116)**	*	**0.374** **(0.076)**	*
Nonwhite college / Nonwhite non-college (COLRACERATIO)	**-0.009** **(0.003)**	*	-0.005 (0.007)	
In-Migration (share population in state today that did not reside here 5 years ago) (INMIG)	0.01 (0.02)		0.02 (0.02)	
Out-Migration (share of population in state 5 years ago that does not reside here today) (OUTMIG)	*-0.09* *(0.05)*	**	**-0.11** **(0.05)**	*
Unemployment Rate (UNEMP)	0.03 (0.04)		0.02 (0.04)	
Share College Enroll Privates (COLPRV)	0.019 (0.012)		**0.033** **(0.012)**	*
Share College Enroll Two-Years (TWOYEAR)	-0.006 (0.012)		-0.005 (0.012)	
Proportion Below Pell (PELL)	**-0.06** **(0.03)**	*	**-0.07** **(0.03)**	*
PELL x COLLAGE (PELLPOP)	*0.0037* *(0.0022)*	**	*0.0039* *(0.0022)*	**
Regional Nonresident Tuition ($1,000) (REGTUIT)	**-0.21** **(0.09)**	*	-0.14 (0.09)	
PhD Degrees Awarded per BA Degrees Awarded (PHDBA)	-0.15 (0.12)		-0.14 (0.11)	
SAT (100 points) (SAT)	*0.29* *(0.18)*	**	*0.31* *(0.17)*	**
Merit Aid State (MERIT)	**-2.86** **(0.27)**	*	**-6.89** **(3.49)**	*
MERIT x INC			0.06 (0.09)	
MERIT x COLRACERATIO			**0.12** **(0.03)**	*
INC x COLRACERATIO			-0.0001 (0.0002)	
MERIT x INC x COLRACERATIO			**-0.0029** **(0.0009)**	*
Within R^2	0.390		0.411	
Observations	1250		1250	

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. All also include interactions between income level and distribution and EDSHARE and INSHARE include relative price measures, none of which are statistically relevant. In-migration and out-migration for EDSHARE equation are rates for entire population while for HESHARE and INSHARE are calculated for college aged population alone. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Standard errors in (parentheses)

Table 5: Dynamic Panel Estimation on Baseline Regressions: Odd Columns are Uninstrumented Fixed Effects Estimates, Even Column Instrumental Estimates using Dynamic Panel GMM Estimator

	EDSHARE		HESHARE		INSHARE	
***Bold 95% significance,** ** italics = 90%*	(1)	(2)	(3)	(4)	(5)	(6)
1-Period Lagged Outcome (LAG)	**0.81 *** (0.02)**	**0.73 *** (0.03)**	**0.62 *** (0.02)**	**0.56 *** (0.03)**	**0.75 *** (0.02)**	**0.53 *** (0.03)**
Median Income in $1,000 (INC)	**-0.39 *** (0.17)**	**-0.45 *** (0.23)**	**0.31 *** (0.16)**	0.17 (0.21)	-0.057 (0.115)	-0.105 (0.134)
Squared Income (INC2)	**0.003 *** (0.001)**	*0.003 ** (0.002)*	**-0.003 *** (0.001)**	0.000 (0.002)	0.001 (0.001)	0.001 (0.001)
75-25 Income Ratio (INEQU)	-1.72 (1.09)	*-2.39 ** (1.45)*	1.49 (1.08)	1.78 (1.36)	0.09 (0.76)	0.23 (0.87)
Share of Population > 65 Years Old (ELDERLY)	-0.01 (0.12)	0.12 (0.22)	0.01 (0.10)	-0.07 (0.21)	0.095 (0.074)	0.002 (0.173)
Share of Population Aged 5-24 (SCHOOLAGE)	0.03 (0.08)	-0.09 (0.15)				
Share of Population Aged 18-24 (COLLAGE)					**0.15 * (0.06)**	**0.44 * (0.08)**
Share Pop. 18-24 / Share Pop. 5-17 (COLRATIO)			0.03 (0.03)	0.04 (0.05)		
Nonwhite school/collage / Nonwhite non-school/collage (SCHOOL/COLRACERATIO)	0.90 (0.72)	0.72 (1.09)			-0.003 (0.002)	*-0.005 ** (0.003)*
Nonwhite college pop / Nonwhite K12 pop (COLK12RACE)			-0.06 (0.10)	-0.19 (0.13)		
(RACEINTERACT)			*0.015 ** (0.009)*	**0.04 * (0.01)**		
In-Migration (share population in state today that did not reside here 5 years ago) (INMIG)	0.04 (0.03)	0.04 (0.04)	**-0.05 * (0.02)**	-0.03 (0.03)	0.003 (0.016)	0.004 (0.016)
Out-Migration (share of pop. in state 5 years ago that does not reside here today) (OUTMIG)	0.03 (0.05)	0.03 (0.05)	-0.01 (0.05)	-0.03 (0.05)	-0.052 (0.033)	**-0.07 (0.03)**
Federal Transfers per Capita ($1,000) (FEDTRAN)	-0.33 (0.22)	-0.36 (0.28)				
Unemployment Rate (UNEMP)	-0.05 (0.04)	0.01 (0.06)	**-0.13 * (0.04)**	**-0.15 * (0.06)**	-0.032 (0.029)	-0.027 (0.041)
Health Costs (HEALTH)	-0.02 (0.04)	0.00 (0.05)				
Crime Rate (CRIME)	*-0.13 ** (0.08)*	0.01 (0.10)				
Court Reform State (COURT)	**0.44 * (0.20)**	**1.04 * (0.34)**	**-0.56 * (0.19)**	**-0.92 * (0.33)**		
Share College Enroll Two-Years (TWOYEAR)					0.001 (0.008)	**0.029 * (0.011)**
Proportion Below Pell (PELL)					0.001 (0.022)	0.008 (0.025)
PELL x COLLAGE (PELLPOP)					-0.001 (0.002)	-0.001 (0.002)
Regional Nonresident Tuition ($1,000) (REGTUIT)					-0.082 (0.066)	*-0.158 ** (0.096)*
PhD Degrees Awarded per BA Degrees Awarded (PHDBA)					-0.086 (0.083)	**-0.246 * (0.120)**
SAT (100 points) (SAT)					0.072 (0.137)	0.215 (0.215)
Merit Aid State (MERIT)					**-1.39 * (0.19)**	**-0.83 * (0.29)**
Within R^2	0.733		0.806		0.708	
Observations	1200	1150	1200	1150	1200	1150

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. All also include interactions between income level and distribution and EDSHARE and INSHARE include relative price measures, none of which are statistically relevant. In-migration and out-migration for EDSHARE equation are rates for entire population while for HESHARE and INSHARE are calculated for college aged population alone. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Standard errors in (parentheses).

Table 6: OLS Regressions for Share of State General Fund Budgets Allocated to Education (EDSHARE) - Supplemental Specifications

***Bold 95% significance**	(1)		(2)		(3)		(4)	
Assembly per Senate Seats (LEGSEAT)	0.19 (0.16)							
Voter Turnout (VOTE)	0.01 (0.01)							
State Government Uniparty (UNIPARTY)	**0.55** **(0.17)**	*						
Governor Election Year (GOVELECT)	-0.28 (0.21)							
Governor Democrat (GOVDEM)	0.12 (0.17)							
GF Revenues: Corp. Income Taxes (REVCORP)			0.02 (0.06)					
GF Revenues: Fuels (REVFUEL)			**-0.43** **(0.08)**	*				
GF Revenues: Indiv. Income Taxes (REVINC)			**0.07** **(0.03)**	*				
GF Revenues: License and Other OMITTED (REVOTH)			*n/a*					
GF Revenues: Lottery (REVLOT)			-0.03 (0.07)					
GF Revenues: Sales (REVSALE)			0.04 (0.03)					
Share GSP: Ag., Forest, Fishing, Mining (GSPAG)					**0.21** **(0.04)**	*		
Share GSP: Const., Manu., Transp., Utilities (GSPCON)					**0.26** **(0.03)**	*		
Share GSP: Government (GSPGOV)					**0.46** **(0.07)**	*		
Share GSP: Wholesale and Retail Trade (GSPTRADE)					**0.49** **(0.11)**	*		
Share GSP: Finance, Insurance, Real Estate and Services OMITTED (GSPFIRE)					*n/a*			
Unemployment Rate - Nonwhites (UNEMPNON)							**-0.06** **(0.02)**	*
Nonwhite Unemp / White Unemp (UNEMPRATIO)							-0.13 (0.13)	
Share Pop >25 with College degree (EDCOL)							-0.08 (0.05)	
Share Pop >25 with HS degree (EDHS)							-0.04 (0.03)	
R^2	0.332		0.330		0.351		n/a	
Observations	1300		1300		1300			

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Specifications (4) was not run using all variables in each model, I have compressed them into one category for presenation purposes. All specifications include variables from Tables 2.

Table 7: OLS Regressions for Share of State Education Budgets
Allocated to Public Higher Education (HESHARE) - Supplemental Specifications

***Bold 95% significance**	(1)		(2)	Within (3)	(4)		(5)	
Assembly per Senate Seats (LEGSEAT)	**-0.34 (0.13)**	*						
Voter Turnout (VOTE)	0.01 (0.01)							
State Government Uniparty (UNIPARTY)	**-0.37 (0.14)**	*	this result does not vary by political party					
Governor Election Year (GOVELECT)	0.08 (0.17)							
Governor Democrat (GOVDEM)	-0.13 (0.14)							
GF Revenues: Corp. Income Taxes (REVCORP)			**0.12 (0.05)**					
GF Revenues: Fuels (REVFUEL)			0.07 (0.07)					
GF Revenues: Indiv. Income Taxes (REVINC)			0.03 (0.02)					
GF Revenues: License and Other OMITTED (REVOTH)			*n/a*					
GF Revenues: Lottery (REVLOT)			**-0.12 (0.06)**					
GF Revenues: Sales (REVSALE)			0.02 (0.02)					
Share GSP: Ag., Forest, Fishing, Mining (GSPAG)				0.00 (0.03)				
Share GSP: Const., Manu., Transp., Utilities (GSPCON)				-0.04 (0.03)				
Share GSP: Government (GSPGOV)				0.07 (0.06)				
Share GSP: Wholesale and Retail Trade (GSPTRADE)				0.03 (0.09)				
Share GSP: Finance, Insurance, Real Estate and Services OMITTED (GSPFIRE)				*n/a*				
College Enrollment Rate (ENRATE)					**0.012 (0.006)**	*		
Weighted Average Nonresident Tuition in the Geographic Region in $1,000 (REGTUIT)					**-0.32 (0.13)**	*		
Number of PhD degrees awarded per Bachelors Degrees Awarded (PHDBA)					0.26 (0.16)			
Share of Public Higher Education Enrollments in Two-Year Colleges (TWOYEAR)					**0.03 (0.01)**	*		
Average SAT in 100s (SAT)					-0.24 (0.41)			
Research & Development Expend. Per Capita ($100) (RND)					-1.20 (0.66)			
Giving per Student ($1,000) (GIVE)					**-0.36 (0.10)**	*		
Endowment per Student ($1,000) (ENDOW)					0.00 (0.05)			
Share PhD Awarded in Science and Engin. (PHDSCI)					**3.78 (1.03)**	*		
Merit Aid State (MERIT)					**1.86 (0.38)**	*		
Capacity (CAPAC)					-0.65 (0.42)			
Unemployment Rate - Nonwhites (UNEMPNON)							**-0.04 (0.02)**	*
Nonwhite Unemp / White Unemp (UNEMPRATIO)							0.04 (0.11)	
Share Pop >25 with College degree (EDCOL)							0.45 (3.19)	
R^2	0.664		0.660	0.659	n/a		n/a	
Observations	1300		1300	1300				

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Specifications (4) and (5) were not run using all variables in each model, I have compressed them into two categories for presenation purposes. All specifications include variables from Table 2.

Table 8: OLS Regressions for Share of State Public Higher Education Budgets Allocated to Public Institutions (INSHARE) - Supplemental Specifications

*Bold 95% significance	(1)		(2)		Within (3)	(4)		(5)
Assembly per Senate Seats (LEGSEAT)	0.02 (0.10)							
Voter Turnout (VOTE)	**-0.03 (0.01)**	*						
State Government Uniparty (UNIPARTY)	0.04 (0.11)							
Governor Election Year (GOVELECT)	0.05 (0.13)							
Governor Democrat (GOVDEM)	**-0.27 (0.11)**	*						
GF Revenues: Corp. Income Taxes (REVCORP)			0.06 (0.04)					
GF Revenues: Fuels (REVFUEL)			**0.20 (0.05)**	*				
GF Revenues: Indiv. Income Taxes (REVINC)			**-0.035 (0.018)**	*				
GF Revenues: License and Other OMITTED (REVOTH)			*n/a*					
GF Revenues: Lottery (REVLOT)			-0.06 (0.05)					
GF Revenues: Sales (REVSALE)			0.01 (0.02)					
Share GSP: Ag., Forest, Fishing, Mining (GSPAG)					0.01 (0.03)			
Share GSP: Const., Manu., Transp., Utilities (GSPCON)					0.01 (0.02)			
Share GSP: Government (GSPGOV)					-0.02 (0.05)			
Share GSP: Wholesale and Retail Trade (GSPTRADE)					0.09 (0.08)			
Share GSP: Finance, Insurance, Real Estate and Services OMITTED (GSPFIRE)					*n/a*			
College Enrollment Rate (ENRATE)						**-0.027 (0.005)**	*	
Research & Development Expend. Per Capita ($100) (RND)						0.90 (0.52)		
Giving per Student ($1,000) (GIVE)						**-0.23 (0.07)**	*	
Endowment per Student ($1,000) (ENDOW)						-0.03 (0.04)		
Share PhD Awarded in Science and Engin. (PHDSCI)						**-3.63 (0.81)**	*	
Capacity (CAPAC)						0.44 (0.32)		
Unemployment Rate - Nonwhites (UNEMPNON)								-0.02 (0.01)
Nonwhite Unemp / White Unemp (UNEMPRATIO)								-0.14 (0.08)
Share Pop >25 with College degree (EDCOL)								-0.03 (0.03)
R^2	0.320		0.320		0.308	n/a		n/a
Observations	1250		1250		1250			

Notes: All regressions include year effects and dummy variables correcting for missing values that equal 1 when the relevant explanatory variable is missing and 0 otherwise. The missing values of the explanatory variables take a value of 0 when the missing dummy equals one. All within R2 represent proportion of within variation in outcome explained by changes in explanatory variables exclusive of the state effects. Specifications (4) and (5) were not run using all variables in each model, I have compressed them into two categories for presenation purposes. All specifications include variables from Table 3.

Appendix Table 1
Variable Definitions and Data Sources

Variable Name	Definition / Explanation*	Source(s)
Outcomes		
EDSHARE	Total Educational Expenditures / General Fund Expenditures	2
HESHARE	Public Higher Education Expenditures (incl. all grant aid) / Total Educational Expenditures	2, 11, 12, 13, 18
INSHARE	Appropriations to Public Institutions / Public Higher Education Expenditures	2, 11, 12, 13, 14, 18
Income Distribution, Prices & Budget Factors		
INC	Median Household Income	6
INC2	Median Household Income Squared	6
INEQU	Income of Household at 75th percentile / Income of Household at 25th percentile	6
INCINEQU	7525 x WEALTH	6
EDPRICE	Employment Weighted Average of K12 and Higher Education Instructor Earnings / Employment Weighted Average of Non-Education Public Employee Earnings	3
HEPRICE	Earnings of Public Higher Education Instructors / Earnings of Public K12 instructors	3
FEDTRAN	Per Capita Total Federal Government Transfers	1
Demographics		
ELDERLY	Share of Population Aged 65 and Older	4, 5
SCHOOLAGE	Share of Population Between Ages 5 and 24	4, 5
COLLAGE	Share of Population Between Ages 18 and 24	4, 5
COLRATIO	Share of Schoolage Population Between Ages 18 and 24	4, 5
SCHOOLRACERATIO	Share of Schoolage Population that is Nonwhite (5-24) / Share of Non-schoolage Adult Population that is Nonwhite	4, 5
COLRACERATIO	Share of College Age Population that is Nonwhite (18-24) / Share of Non-College Age Adult Population that is Nonwhite	4, 5
COLK12RACE	Share of College Aged Population that is Nonwhite / Share of K12 Aged Population (5-17) that is Nonwhite	4, 5

RACEINTERACT	COLK12RACE times Share of Adult Population (25 and over) that is Nonwhite	4, 5
INMIGALL	Share of Overall Population Residing in State Today that Did Not Reside in State 5 Years Ago	4, 5
OUTMIGALL	Share of Overall Population that Resided in State 5 Years Ago that No Longer Resides In State Today	4, 5
NETMIGALL	INMIGALL - OUTMIGALL	4, 5
INMIGCOL	Share of 18-24 Year Old Population Residing in State Today that Did Not Reside in State 5 Years Ago	4, 5
OUTMIGCOL	Share of 13-19 Year Old Population that Resided in State 5 Years Ago that No Longer Resides In State Today	4, 5
NETMIGCOL	INMIGCOL - OUTMIGCOL	4, 5
Enrollment Pressure / Competition		
COLPRV	Share of Full-Time Equivalent Enrollments in Higher Education Institutions that Attend Privates (FTE = 40% for graduates, 35% for undergraduates and 33% for two-year students)	8, 11, 12, 13
K12PRV	Share of Elementary and Secondary School Enrollments in Private Schools	8
HE_ENROLL	FTE Graduate, Undergraduate and Two-Year Students at All Public Two- and Four-Year Institutions	11, 12, 13
K12_ENROLL	Total Elementary and Secondary School Enrollments in Public Schools	8
TWOYEAR	Share of Public Higher Education (FTE) Enrollments in Two-Year Colleges	11, 12, 13
CAPAC	Predicted Public Higher Education FTE Enrollments / Actual Public Higher Education FTE Enrollments	1, 4, 8 ,11, 12, 13
EDCOL(HS)	Either Share of Population Aged 25 and Older with High School Degree or with College Degree	1, 4, 7
SAT	Average SAT Score of High School Graduates that Plan to Attend College	8, 23
ENRATE	HE_ENROLL / Number of Public High School Graduates	8, 11, 12, 13
Competing Interests, Economic Conditions		
HEALTH	Health Care CPI x Share of Adult Population Aged 65 or Older	4, 22

CRIME	Murders, Rapes, Robberies, Assaults, Burglary, Larceny and MV Theft per 100,000 Population	24
UNEMP	Unemployment Rate - Entire Population	10
UNEMPNON	Unemployment Rate - Nonwhite Population	10
UNEMPRATIO	UNEMPNON / UNEMP	10
COURT	=1 in State-Year After Court Decision Mandated K12 Finance Reform	28
GSPAG	Share of State GSP Generated by Agriculture, Forest, Fishing and Mining Activity	9
GSPCON	Share of State GSP Generated by Construction, Manufacturing, Transportation and Utilities	9
GSPFIRE	Share of State GSP Generated by Finance, Insurance, Real Estate and Services	9
GSPGOV	Share of State GSP Generated by Government	9
GSPTRADE	Share of State GSP Generated by Retail and Wholesale Trade	9
REVCORP	Share of State General Fund Revenues Generated by Corporate Income Taxes	2
REVFUEL	Share of State General Fund Revenues Generated by Motor Fules Sales Taxes	2
REVINC	Share of State General Fund Revenues Generated by Individual Income Taxes	2
REVOTH	Share of State General Fund Revenues Generated by License Taxes and Fees and Other Sources	2
REVLOT	Share of State General Fund Revenues Generated by Lottery Revenues	2
REVSALE	Share of State General Fund Revenues Generated by State Sales Taxes	2
Political Factors		
GOVDEM	=1 in State-Year When Governor is a Democrat	1
UNIPARTY	=1 in State-Year When Both Houses of State Legislature are Controlled by the Same Party	1
GOVELECT	=1 in Years When Governor Seat is Up for Election	1
ASSEMBLY	Number of Assembly Seats per Capita	1
SENATE	Number of State Senate Seats per Capita	1
VOTE	Share of Voting Age Population Casting Votes in Congressional Election	1

Other Higher Education Variables

ENDOW	Endowment Generated by Public Four-Year Institutions per FTE Public Enrollment in the State	11, 12, 13, 25, 27
GIVE	Total Giving per FTE Student from All Sources at Public Research Universities in the State	11, 12, 13, 27
MERIT	=1 in the State-Year Where there are Substantial Merit Aid Scholarship Programs	30
PELL	Proportion of Households with Annual Incomes Below the Maximum to be Eligible to Receive a Federal Pell Grant	6, 34
PHDPERBA	Ph.D degrees Awarded in Public Institutions / Bachelors Degrees Awarded by These Institutions	11, 12, 13
REGTUIT	Enrollment Weighted Average Nonresident Tuition at 4-Year Public Institutions in the Geographic Region (exclduing own state) in $1,000	11, 12, 13
RND	Total Research and Development Expenditures at Public Universities per Capita	1, 3, 11, 13, 32
SCIPHD	Share of Ph.D degrees Awarded at Public Institutions in Science and Engineering Fields	11, 13, 32

Institutional Characteristics

Autonomy	Split Sample in Half According to Institutional Autonomy	31
Biennial Budget Cycle	23 States Operate on a Biennial Budget	16
Decades	Sample Split by 1972-1982, 1983-1992 and 1993-2001	
Funding Formula	29 States Have Higher Education Funding Formulas	33
Governor Power	37 States Have Governors that Can Reduce Appropriations Without Legislative Approval	16
Political Competition	Split Sample in Half According to Competitiveness of Political Processes in the States	29
Population Density	Split Sample in Half According to Population per Square Mile of Land Area	1
Region	Split for 11 Southern States and for 9 Northeastern States	1
Uniparty Government	Sample Split by State-Year where Legislature and Governorship Controlled by 1 Party (on average 21 states per year)	1

Appendix Table 1, Continued
Data Sources

1. U.S. Bureau of the Census, *Statistical Abstract of the United States: 1976-2001*
2. U.S. Bureau of the Census, State Government Finance Files, 1972-2001
3. U.S. Bureau of the Census, State Government Employment and Payroll, 1972-2001 http://www.census.gov/govs/www/apesst.html
4. U.S. Bureau of the Census, Population Estimates Program, http://eire.census.gov/popest/archives/state/st_sasrh.php
5. U.S. Bureau of the Census, Decennial Census Microdata Files: via IPUMS http://www.ipums.org
6. U.S. Bureau of the Census, Current Population Survey (unpublished data), *Estimates of Income of Households by State 1979-2001*
7. U.S. Bureau of the Census, Current Population Survey Microdata Files: via CPS Utilities at http://www.unicon.com/
8. U.S. Department of Education, National Center for Education Statistics, D*igest of Education Statistics: 1976-2002*
9. U.S. Department of Labor, Bureau of Labor Statistics. Employment and Earnings. Regional Economic Information System - http://www.bea.doc.gov/bea/regional/gsp/
10. U.S. Department of Labor, Bureau of Labor Statistics. Local Area Unemployment Statistics (published and unpublished data)
11. U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS) Surveys via WebCASPAR. http://caspar.nsf.gov
12. U.S. Department of Education's Higher Education General Information Surveys (HEGIS) via WebCASPAR
13. IPEDS Peer Analysis System www.nces.ed.gov/ipedspas/
14. National Association of State Student Grant and Aid Programs (NASSGAP), Annual Survey Reports. www.nassgap.org
15. National Association of State Budget Officers (NASBO). *Fiscal Survey of the States* . Various years. www.nasbo.org
16. NASBO. *Budget Processes of the States* . Various years.
17. NASBO. *State Expenditure Reports.* Various years.

18. Illinois State's GRAPEVINE System - http://www.coe.ilstu.edu/grapevine/

19. Directory of Faculty Contracts and Bargaining Agents In Institutions of Higher Education (1977-1996)

20. http://www.unionstats.com/

21. Education Commission of the States. http://www.ecs.org/ecsmain.asp?page=/html/IssuesPS.asp

22. 2003 Economic Report of the President

23. College Entrance Examination Board, "*College-Bound Seniors: 2001 Profile of SAT Program Test Takers*"

24. Federal Bureau of Investigation's *Uniform Crime Reports*

25. Chronicle of Higher Education. http://chronicle.com/stats/

26. American Council on Education Center for Policy Analyisis, *2000 Status Report on the Pell Grant Program* .

27. American Council on Education, *Voluntary Support of Education* , Various years.

28. Conference on State Aid to Education, Education Finance and Accountability Program, Center for Policy Research, The Maxwell School, Syracuse University (April 2002)

29. Holbrook and Van Dunk (1993)

30. Dynarski (2004)

31. Lowry (2001)

32. National Science Foundation via WebCaspar

33. MGT of America

34. American Council on Education, *Status of the Pell Grant Report*

Appendix Table 2
Summary of Baseline Regression Changes on Data Sub-Samples

	Autonomy		*Budget Cycle*		*Court Reform*		*Funding Formula*		*Governor Power*		*Northeast*		*Political Comp.*		*Pop. Density*		*Uniparty Gov.*	
	Yes	No	2 Year	1 Year	Yes	No	Yes	No	Yes	No	In	Out	High	Low	High	Low	Yes	No
EDSHARE																		
Income				✓											✓			
Elderly				✓		✓							✓				✓	
Unemployment					⊗	✓				✓					✓	⊗	⊗	✓
Health				✓	⊗	✓			✓				⊗	✓	✓			✓
Crime				✓	✓	⊗												
Federal Transfers			✓			✓			✓									
HESHARE																		
Income	✓		✓		⊗	✓		✓		✓		✓	✓			✓		✓
Elderly	✓	⊗	✓								⊗	✓	✓					
Race		✓				✓		✓	✓			✓	✓	⊗				
Unemployment		✓							✓	⊗				✓			✓	
Out-migration						✓					⊗	✓						✓
INSHARE																		
Income		✓										✓					✓	
Elderly								✓	✓			✓		✓	✓			
College Population											⊗	✓	✓			✓		
Race				✓							✓		✓			✓	✓	
Out-migration	✓																	
SAT								✓					✓		✓			
PhD per BA								✓					✓			✓	✓	
Regional Tuition				✓			✓		✓		⊗	✓		✓		✓		

✓ = baseline results driven by this sub-sample, or if not significant in overall but significant in sub-sample
⊗ = produced significant estimates opposite those in baseline regressions
Note: Table presents only variables that were statistically different from other sub-sample with 90% confidence